Brio Site Task Force
2501 Dixie Farm Road
Houston, Texas 77089

MAINTENANCE, OPERATIONS, AND MONITORING PLAN

FEBRUARY 2004

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1.0 INTRODUCTION

This Post Closure Maintenance, Operation, and Monitoring Plan (MOM) describes the Brio Site monitoring, inspection, maintenance, and operations activities following closure of the site.

1.1 SITE LOCATION AND HYDROGEOLOGIC DESCRIPTION

The Brio Superfund Site is located in Harris County, Texas, approximately 20 miles southeast of Houston, Texas. The site is approximately 1.5 miles southwest of Interstate Highway 45 South (Gulf Freeway) at the Dixie Farm Road exit. The site is located on both the north (Brio North) and south (Brio South) sides of Dixie Farm Road.

Brio North, approximately 48.8 acres, is bounded on the southwest by a Harris County flood control ditch known as Mud Gully, on the northwest by the former Southbend subdivision, on the northeast by Beamer Road, and on the Southeast by Dixie Farm Road. Brio North is located in Harris County, outside of any municipality.

Brio South, approximately 9.3 acres, is bounded on the southwest by Dixie Oil Processors (DOP) site, on the northwest by Dixie Farm Road, and on the northeast and southeast sides by open land.

Portions of the Brio Site processing equipment were dismantled and removed in 1989. The remaining process equipment and most of the office-type maintenance buildings were removed in the period of 1992 to 1994, and the last remaining tank on Brio North was removed in 1998. The stormwater management system (API separator and the North and South Impoundments) were removed in 2000 to 2001 in preparation for the final remedy.

Geologic conditions beneath the site consist of the following:

- A 12 to 20 foot thick clay layer termed the Upper Clay Unit (UCU).
- A 15 to 25 foot layer of alternating silt, sand, and clay beds with random sand channels braided within. The layer is termed the Numerous Sand Channel Zone (NSCZ), and contains affected groundwater.
- A confining clay layer rests below the NSCZ and is termed the Middle Clay Unit (MCU). The layer is approximately eight to 20 feet thick and is the hydraulic barrier between the affected NSCZ and underlying groundwater zones.
- The second groundwater zone is termed the Fifty Foot Sand Zone (FFSZ). It is approximately 50 feet below the ground surface.

1.2 REMEDY COMPONENT DESCRIPTION

The Brio Site remedy consists of:

- Vertical Barrier Wall - A sub-grade barrier wall constructed to limit the potential for off-site migration of affected groundwater in the NSCZ. The wall is constructed of soil-bentonite slurry and sheet pile, and is keyed into the MCU. The sheet pile portion of the barrier wall includes a cofferdam that encompasses a portion of Mud Gully near Pit B.
- Site Cover – The site cover consists of a composite cover extending to the limits of the barrier wall. The cover includes a gas collection layer, a flexible membrane liner, compacted clay, and vegetation to limit erosion.
- Groundwater Gradient Control - A groundwater recovery system in the NSCZ creates an inward gradient control by pumping the NSCZ groundwater to the surface where it is stored and treated.
- Groundwater Treatment Plant (WTP) - The WTP treats recovered groundwater. Water that passes the USEPA treated water criteria is discharged to Mud Gully.
- Dense Non-aqueous Phase Liquid (DNAPL) Recovery System – The DNAPL recovery system collects DNAPL from the Pit J area. The recovered DNAPL is stored and then shipped off-site for disposal.

1.3 POST-CLOSURE ACTIVITIES

Post-closure activities consist of active monitoring, groundwater/ DNAPL/ recovery/ treatment/ disposal operations, inspection, and maintenance of the constructed remedy. An Annual Effectiveness Report (AER) will be submitted annually to document the performance of the remedy.

2.0 INSPECTION

2.1 INSPECTION OVERVIEW/SCHEDULE

Post closure inspection activities for the Brio Site provide the continued effectiveness of site security, and site containment and isolation measures. Table 1-Brio Site Master Schedule presents the inspection activities and frequencies.

2.2 SITE FACILITY AND SAFETY INSPECTIONS

Inspection of the site is based on a visual inspection by walking the site, including the perimeter of the earthen cover and vertical barrier wall, in such a manner that the deficiencies can be identified. The following sections contain specific elements that will be inspected.

The site will be inspected for potential health and safety hazards. The site safety inspection standard operating procedure is contained in the Worker Health and Safety Plan.

2.2.1 Onsite Access Roads, Gates, Fences, and Signs

Onsite roads will be inspected for erosion, deterioration, and excessive overgrowth. Note and report any overgrowth or excessive deterioration to site management.

Site perimeter fencing is used to maintain site security. All perimeter fencing will be inspected for evidence of deterioration or damage. The site fence along Mud Gully will also be inspected after rainfall events that cause Mud Gully water levels to reach the fence line. Any breach discovered will be repaired or mended with temporary fencing materials as soon as practicable. Deteriorated fencing will be repaired or replaced in a timely manner in order to avoid further fence deterioration or damage.

Gates will be inspected for deterioration or damage and repaired or temporarily mended as soon as practicable. Deteriorated gates will be repaired or replaced in a timely manner in order to avoid further deterioration or damage. Locks will be inspected to ensure proper operation. Evidence of tampering, forced entry, or deterioration will be reported to site management. See Figure 1 for the location of gates.

Signs have been placed on gates and perimeter fencing at a spacing of no greater than 150 feet. These signs read as follows:

NO TRESPASSING. RESTRICTED ACCESS.

NO TRASPASAR. NO ENTRADA.

Inspectors will check for missing, unreadable, vandalized, obstructed (by vegetation) or damaged signs. Signs will be repaired or replaced if these conditions are found.

2.2.2 Cover

A site wide cover system has been constructed over the Brio Site. See Figure 3 for the location and configuration of the cover. The cover system will be inspected during the groundwater and DNAPL recovery and treatment inspections. Inspectors will report to site management any evidence of damage by vehicular traffic, soil erosion, gullies, cracks, burrowing animals, or slope failures. The cover will also be inspected for localized settlement, ponding, distressed vegetation, and poor drainage. The cover design is presented in Figure 7.

2.2.3 Site Drainage And Erosion Control

The drainage patterns for the Brio North and Brio South cover systems are shown in Figure 3. Ditches, roads between cover compartments, swales, and other drainage features will be inspected for the ability to deliver runoff to the ditches and detention basins shown in Figure 3. The detention basins on Brio North and Brio South will be inspected for excessive erosion, obstructed drainpipes, and excessive trash.

2.2.4 Barrier Wall

A vertical barrier wall system was constructed on Brio North and Brio South to isolate the affected NSCZ groundwater and DNAPL from discharging into Mud Gully. The upper surface of the barrier wall is located under the cover system and is therefore not visible for inspection; however, the barrier wall alignment will be visually inspected for penetrations by new utilities or other penetrations. Figure 3 shows the alignment of the barrier wall.

2.2.5 Groundwater/DNAPL Recovery and Treatment System

2.2.5.1 Water Treatment Plant - The water treatment plant (WTP) operating instructions manual is incorporated by reference. The WTP is expected to remain active during the post closure period. Inspection procedures contained in the manual will be conducted.

2.2.5.2 Groundwater Collection Hub Facilities - Cover compartments B, C, and D each have a Hub Facility to separate free phase organics from groundwater prior to transfer to the water treatment plant. Compartment A is piped to the Compartment C system where water from both compartments is combined prior to separation. Figure 2 shows the location of each hub and the approximate location of the recovery system piping.

Inspections of the hub facilities include the condition of the hub building, tanks, air compressor, nitrogen system, gauges and level sensors, and piping.

2.2.5.3 Safety Relief Devices - The pressure relief devices in use at the Brio Site are safety devices that do not contain instrumentation and do not require external operators. It is necessary to establish an active program for inspection and maintenance to demonstrate that they will operate when called upon in emergency situations.

Safety relief devices will be inspected annually to document operational readiness as required by OSHA 29 CFR 1910 and API Recommended Practice 510 and 576. A qualified company will perform these inspections.

2.2.5.4 Underground Utilities - Utilities servicing the groundwater and DNAPL recovery systems are buried underground. The utility corridor will be inspected for leaks and settlement.

2.2.5.5 Wells and Piezometers - NSCZ recovery wells located on the Brio Site (see Figure 2) will be inspected for the condition of the protective casing, the concrete base, protective posts (painted yellow if any), pumps, and discharge plumbing. Inspectors will report any evidence of leaks, soil erosion, tampering, or damage.

NSCZ piezometers located on the Brio Site (see Figure 2) will be inspected for the condition of the well heads and subsurface vaults.

The FFSZ monitoring wells located on the Brio site (see Figure 2) will be inspected for the condition of the protective casing, the concrete base, protective posts (painted yellow if any), cap, and lock. Inspectors will report any evidence of erosion, tampering, or damaged, missing, or inoperative locks to management.

2.2.6 Gas Recovery and Collection System

Inspection of the cover gas venting and collection system generally consists of evaluating each compartment for VOC emissions for the first year of operation and inspecting the piping, blower, and carbon canister system for proper operation and absence of leaks.

The compartments that pass the USEPA criteria for the first year will be valved off and the pressure checked. Inspections of valved off compartments consist of inspecting piping and gauges for signs of deterioration, leaks, and for proper operation. Figure 3 presents the locations of the gas collection vents.

2.2.7 Mud Gully

Improved sections of Mud Gully extend from 1100 feet north of Dixie Farm Road to Dixie Farm road (refer to Figure 3). This section will be inspected for slope failure, excessive debris, or anything that could impede flow in the channel. Harris County Flood Control will be notified of conditions that could impede channel flow.

The NSCZ wells and associated utilities located within the cofferdam (refer to Figure 2) will be inspected for damage.

2.3 REPORTING ACTIVITIES

The inspection checklists will be completed during the inspection activity (Appendix A) noting any significant items of concern. The BSTF will review the findings and take corrective action as necessary.

The inspection reports and pressure safety relief device inspection documents will be maintained onsite. A summary of the inspections will be included in the Annual Effectiveness Report.

3.0 MAINTENANCE OVERVIEW/SCHEDULE

Routine maintenance activities are discussed in the following sections. Non-routine maintenance activities will be conducted on an as-needed basis. Table 1-Brio Site Master Schedule presents the maintenance activities and frequencies.

3.1 SITE MAINTENANCE

3.1.1 Site Perimeter Maintenance

A site-wide perimeter fence provides site security.

Fences are six feet tall and topped with three strands of barbed wire overhanging outwards. Lockable gates are located at each point of entry to the site. Rusted portions of the fence or gate will be repaired or replaced as necessary. Small tears in the chain link fabric can be repaired or replaced by wire splicing. Broken wire, larger tears and missing sections of chain link fabric will be replaced in fence panel lengths. Poles and top bars which are misaligned or in poor condition will be straightened or replaced. Cross braces will be tightened as necessary to keep gates plumb and square.

Gate hinges and all gate and monitoring well locks will be lubricated. Torn or damaged access gates, gate hinges, and fencing will be repaired or replaced as necessary for site security. Repair or replace any missing or damaged locks.

Signs are placed on gates and perimeter fencing at a spacing of no more than 150 feet. Damaged, deteriorated, faded, unusable, and missing signs around the site will be repaired or replaced as needed.

Brush, trees, and woody plants and vines will be removed within the site fence line. An interior five-foot perimeter strip adjacent to the fence line will be mowed.

3.1.2 Onsite Access Roads

Continued maintenance of the onsite access roads is necessary for access to various areas of the site. Repair options for the access roads will be determined at the time of repair.

3.1.3 Cover

To maintain the integrity, slope, and thickness of the cover system, soil will be added or replaced as necessary. Cracking of the surface soil is expected and is not considered to be a

defective cover. Site-wide vegetation will only be mowed as special conditions warrant.

The geosynthetic layers will be repaired if damaged. The cover design is presented in Figure 7.

Obstructions or debris that would impede water flow will be removed from the drainage swales and discharge structures. Plant detritus will be cleared from drainage structures. Blockage from ditches, drain pipes, gullies, and weirs will be cleared as needed.

3.1.4 Barrier Wall

The upper surface of the barrier wall is located under the cover system and is therefore not visible for inspection. Should an extraordinary event occur that damages the integrity of the barrier wall, then the damage will be repaired.

3.1.5 Groundwater/DNAPL Recovery and Treatment System

3.1.5.1 Water Treatment Plant - WTP maintenance is specified in the WTP operating instructions manual.

3.1.5.2 Groundwater Collection Hub Facilities - Groundwater hub facility components will be maintained according to manufacturer's recommendations for pumps, tanks, compressors, regulators, sensors, piping, and other components. The groundwater hub facility as-built design and procedures are specified in the WTP operating instructions manual.

Non-routine maintenance of groundwater and DNAPL recovery systems will be performed on an as-needed basis according to manufacturer's recommendations. Deteriorated or damaged recovery system piping will be replaced as needed.

3.1.5.3 Maintenance of Safety Relief Devices-Safety relief devices will be maintained according to manufacturer's specifications. A qualified individual will perform the maintenance.

3.1.5.4 Underground Utilities - Utilities servicing the groundwater and DNAPL recovery system are buried underground. Settlement along the route of these utilities will be re-leveled with suitable soil. If a leak is detected, the leak will be mitigated. Soil that is exposed to affected material will be removed and disposed offsite. Clean soil will replace the removed soil in a manner that is consistent with the construction compaction and shape.

The underground utility as-builts are contained by reference in the WTP operating instructions manual.

3.1.5.5 Wells and Piezometers - Maintenance of NSCZ recovery wells, NSCZ piezometers, and FFSZ monitoring wells may include repair or replacement of damaged protective casings, replacing missing locks, and repair or replacement of removed, destroyed, or severely damaged protective posts. If the monitoring well becomes nonfunctional, the well will be reconditioned. If the monitoring well cannot be reconditioned or is damaged beyond repair, then the monitoring well will be replaced. Plans for reconditioning or replacement will be developed on an as-needed basis. The USEPA will be notified of the BSTF's proposed well replacement plan.

Pumps, instrumentation and piping will be maintained according to the manufacturer's recommendations.

As-built records for the pumping equipment and utilities are contained by reference in the WTP operating instructions manual.

As-built records for each NSCZ groundwater recovery well, DNAPL recovery well, and piezometer are contained in Appendix D.

The FFSZ groundwater monitoring well construction reports are contained in Appendix E.

3.1.6 Gas Recovery and Collection System

A gas collection system was installed as part of the cover construction. Refer to Figure 3 for the location of the four gas collection compartments and vents. The concrete pads surrounding the vents will be repaired as necessary. Maintenance of the venting system may include repair or replacement of the vent pipe, adding additional soil due to erosion, and repairing the geosynthetic liner.

3.1.6.1 Year One - Section 4.3 explains the operation of the gas collection system. The operation of the gas collection system is divided into short-term and long-term operation. The short-term operation will be performed during the first year. This consists of an active recovery system connected to each gas collection compartment that applies a low vacuum on the system. The air exiting the gas collection system passes through at least two carbon canisters before being exhausted to the

atmosphere. Piping, hoses, gauges, and carbon canisters will be replaced or repaired upon signs of visible deterioration or malfunction.

3.1.6.2 Post Year One - The long-term operation of the gas collection system will be defined at the completion of the Year One investigation.

3.1.7 Mud Gully

Harris County Flood Control District (HCFCD) is responsible for maintenance of Mud Gully. HCFCD will be notified for areas needing repair as identified during inspection activities in Section 2.2.7.

The NSCZ wells along Mud Gully will be maintained per Section 3.1.5.5.

3.1.8 Preventive Maintenance for Safety Equipment

Safety equipment used at the Brio Site will be maintained meet federal and state OSHA regulations. The maintenance procedure is contained in the Worker Health and Safety Plan.

3.2 REPORTING ACTIVITIES

The site maintenance checklist (see Appendix B) will be completed as maintenance items are accomplished. All maintenance reports and checklists will be maintained in the project files.

A summary of maintenance activities will be included in the Annual Effectiveness Report.

4.0 OPERATIONS

4.1 GROUNDWATER RECOVERY AND TREATMENT SYSTEM

The purpose of NSCZ groundwater recovery at the Brio Site is to contain plume migration by providing an inward groundwater gradient. The perimeter barrier wall provides additional plume containment in the event of temporary groundwater recovery shutdown.

The leading front of a plume on Brio-South is outside of the barrier wall because of the location of a major pipeline corridor. Active treatment of groundwater in this area will consist of operating two groundwater recovery wells during normal working hours. A groundwater discharge pipeline is connected to the Brio-South Hub Facility located on Compartment D as described in Section 4.1.1.2 below. Section 5.3.2.1 describes the monitoring activities of this plume.

Recovered groundwater is treated at an onsite water treatment plant (WTP) to meet USEPA approved discharge standards and is then batch discharged to Mud Gully. This plan describes batch processing. The Consent Decree allows for discharge into Mud Gully to be continuous or batch (SOW Table 2-5).

4.1.1 Description and Operation of System Components

4.1.1.1 Recovery Wells and Piezometers - Groundwater recovery wells will be pumped at a frequency and rate to maintain an inward gradient. Piezometers will be used to monitor inward gradient (refer to Section 5.3.1).

4.1.1.2 Compartment A - Compartment A contains two NSCZ groundwater recovery wells. These wells are piped into the Compartment C NSCZ groundwater recovery system as presented in Figure 2.

4.1.1.3 Compartment B - Compartment B contains five NSCZ groundwater recovery wells and 13 DNAPL recovery wells as presented in Figure 2. The NSCZ groundwater is pumped to Hub Facility B where it is processed through a LNAPL/DNAPL/water separator. The separator has a nitrogen sweep that is vented to the WTP vapor treatment system. The water from the separator is pumped to the WTP for treatment. The LNAPL and DNAPL are combined and pumped to the DNAPL storage tank in the WTP Facility where it is stored until shipment offsite for disposal.

4.1.1.4 Compartment C - Compartment C contains five NSCZ groundwater recovery wells as presented in Figure 2. Compartment C also receives water from Compartment A,

Compartment D, and the South Plume. The NSCZ groundwater is pumped to Hub Facility C where it is processed through a LNAPL/DNAPL/water separator. The separator has a nitrogen blanket that is vented to the WTP vapor treatment system. The water from the separator is pumped to the WTP for treatment. LNAPL and DNAPL are combined and pumped to the DNAPL storage tank in the WTP area where the fluids are stored until being shipped to an offsite facility for disposal.

4.1.1.5 Compartment D - Compartment D contains three NSCZ groundwater recovery wells. Two wells located in the NSCZ groundwater plume that extends beyond the barrier wall on Brio-South are piped to the Compartment D groundwater recovery system. Figure 2 presents the locations of the Compartment D and South Plume wells. The combined groundwater from Compartment D and the South Plume are pumped to the Hub C Facility on Brio-North were it is combined with the groundwater from Compartment A and Compartment C.

4.1.1.6 The Water Treatment Plant Facility - The WTP facility treats water recovered from the NSCZ wells and rain/wash water from the sumps in the WTP facility. Water is stored in tank T-212A prior to treatment. The water from T-212A is pumped to an air stripper where the volatile organic compounds (VOCs) are removed.

The vapor phase stream from the air stripper is sent through the resin based extraction unit (PURUS) where the VOCs are removed from the air stream and then condensed and stored in the DNAPL tank T-218. Alternately, the VOC vapor phase stream can be routed to a carbon and potassium permanganate scrubber where the VOCs are adsorbed or oxidized.

The water phase stream is piped to two aqueous phase carbon vessels that are connected in series where the semivolatile organic compounds (SVOCs) and remaining VOCs are adsorbed.

The effluent from the aqueous phase carbon vessels is piped to one of three holding tanks (T-213A, T-213B, or T-213 C). Treated water is held in these tanks until it is sampled, tested, and passes the Brio Site discharge criteria.

4.1.2 Treated Water Sampling, Analytical Testing, and Discharge

4.1.2.1 Treated Water Sampling - Water sampling includes taking an eight point composite sample from one of three treated water holding tanks. Refer to the Sampling and Analysis/QAQC Plan in Appendix C for treated water sampling procedures.

4.1.2.2 Treated Water Discharge Criteria and Approval Process - Table 2 presents the list of required testing parameters and the discharge criteria. Treated water that passes the discharge criteria can be discharged to Mud Gully. A record for each batch discharge will be maintained in the site file. The discharge record consists of the analytical results reported in the Brio-specific format shown in Figure 4 and the WTP Discharge Form shown in Figure 5.

4.1.2.3 Schedule - Table 1-Brio Site Master Schedule presents the treated water discharge schedule.

4.1.2.4 Reporting - A summary of treated water analytical results and discharge information will be submitted to the USEPA in the Annual Effectiveness Report per Table 1.

4.2 DNAPL RECOVERY SYSTEM

4.2.1 DNAPL Recovery System Overview

An initial DNAPL Recovery Baseline Evaluation Study will be conducted following post closure as outlined in Section 5.4.

Thirteen DNAPL recovery wells plus six groundwater recovery wells located around Pit J are used to recover DNAPL during normal site work hours. Pumping from the DNAPL recovery wells will be adjusted to establish an optimal pumping rate and schedule (see Section 5.4.2) at Hub Facility B. DNAPL and groundwater are separated and the DNAPL will be pumped to tank T-218 located at the WTP facility. DNAPL will be shipped to an offsite disposal facility. Appendix G presents the DNAPL shipping procedures and forms.

The DNAPL Recovery Program Field Change Order 18 is contained in Appendix F.

4.2.2 DNAPL and Pit J Groundwater Recovery Wells

The locations of the 13 DNAPL wells and six groundwater recovery wells can be found in Figure 2. The well construction reports are presented in Appendix D.

4.2.3 DNAPL Disposal Volume

The amount of DNAPL collected and disposed of is measured at both Tank T-218 and from the disposal facility records.

4.2.4 Reporting

A record will be maintained onsite that documents DNAPL collection and disposal volumes. A summary of DNAPL collection and disposal will be submitted to the USEPA in the Annual Effectiveness Report per Table 1.

Each DNAPL shipment will be reported to the Texas Commission on Environmental Quality (TCEQ) per State regulations. Appendix G presents the DNAPL reporting procedure and shipping forms.

4.2.5 Schedule

Table 1-Brio Site Master Schedule presents the DNAPL disposal and reporting frequency.

4.3 COVER COMPARTMENT GAS COLLECTION

4.3.1 Cover Compartment Gas Collection Overview

The cover is divided into compartments, based on water runoff considerations and the relationship to former pit areas (refer to Figure 3). The cover installed over each compartment has a gas collection layer, a surface vent, and gas collection system. The vent system will be vacuum assisted during the First Year Baseline Testing Program and may be closed off after the first year based on test results.

4.3.2 Pre-operations Pilot Study and Gas Collection System Design

The objectives of the pre-operations pilot study are as follows:

1. To identify the type of equipment necessary to perform the First Year Baseline Testing Program
2. To develop the operating procedures to perform the First Year Baseline Testing Program
3. To develop the VOC loading calculations used to compare the actual loading to the established criteria located in Section 4.3.3.
4. To develop the closed vent maximum pressure criteria (or alternative).
5. Prepare a draft and final gas collection system design report (see Section 4.3.5)

Each compartment will undergo the pilot study prior to beginning the First Year Baseline Testing Program. Each compartment can be tested individually or concurrently. The pilot

study will conclude within the first three months of post-closure. The draft and final gas treatment system design reports will be submitted to the USEPA for approval.

4.3.3 First Year Baseline Testing Program

Once the final gas treatment system design is approved by the USEPA, the First Year Baseline Testing Program can begin.

The vent system will be manifolded to a treatment system(s). The treatment system(s) will, at a minimum, consist of two carbon units in series. The airflow between the two carbon units will be monitored, initially daily. Breakthrough is defined as a reading of 50 ppm VOCs, in which case the spent carbon unit will be replaced by a fresh unit within 12 hours. After startup, the monitoring frequency between the two carbon units will be adjusted to a time period of no greater than one tenth (1/10) the expected carbon life.

An initial baseline monitoring of total VOC production on a compartment by compartment basis will be carried out once the system is operational. The baseline monitoring consists of one sample and flow measurement per month of VOCs, per compartment, for a minimum of 12 consecutive months. The amounts and types of VOCs recovered will be reported. Prior to any compartment(s) being closed off, 12 months of such data will be presented supporting the closing. (The initial baseline data may be used for this purpose.) Compartments which generate less than 40 pounds per month of total VOCs may be valved off. For those compartments which are valved off, a maximum pressure will be defined during the design to determine when the closed off compartment must be reopened to the treatment system.

If the amount of VOCs in the air flow to the treatment system results in breakthrough of the carbon units occurring more frequently than once (1) every ten (10) days, then a study evaluating the efficiency of the VOC recovery and treatment system will be prepared. This study evaluates: (1) changing the treatment capacity/method, or (2) increasing VOC recovery through installation of vertical wells, whichever optimizes VOC recovery. This study considers value engineering concepts, cost effectiveness, safety, VOC recovery rates, and the short term and long term potential for creating emissions in the optimization process.

4.3.4 Long Term Monitoring and Collection System

Based on the findings of the first year baseline testing program, a long-term program for each of the compartments will be developed. The long-term gas collection system as-built plans and operations will be added to the Maintenance, Operations, and Monitoring Plan.

4.3.5 Reporting

4.3.5.1 Draft Gas Treatment System Design - A draft Gas Treatment System Design will be submitted after completing the pre-operations pilot study.

4.3.5.2 Final Gas Treatment System Design - After receipt of the USEPA's comments on the Draft Design, BSTF will submit a Final Design for USEPA approval. The USEPA's approval of the final design is required before initiating the implementation of the First Year Baseline Testing Program. All Final Design documents will be approved be a Professional Engineer registered in the State of Texas."

Implementation of the First Year Baseline Testing Program will begin following approval of the Final Design by the USEPA.

4.3.5.3 Completion Report – The USEPA will be notified upon completion of First Year Baseline Testing Program. A Completion Report will be prepared which documents the physical construction of the system. The Completion Report will include, as appropriate, data collected during the implementation phase and documentation of compliance with the terms of the QA/QC plan, and a certification from a Professional Engineer registered in the State of Texas that the work has been completed in compliance with the terms of the Gas Treatment System Design.

4.3.5.4 Long-term Reports - The long-term monitoring and collection reporting will be scheduled in the future.

4.4 AREAS REGULATED FOR VINYL CHLORIDE

4.4.1 Regulated Areas and Signs

All facilities that contain affected groundwater, DNAPL, or vinyl chloride vapors will be considered regulated areas per 29 CFR 1910.1017 and will be marked with signs that read:

CONTAMINATED WITH VINYL CHLOIRIDE
CANCER-SUSPECT AGENT

4.4.2 Reporting

Reports will be made to the OSHA Area Director not later than one month following the establishment of a regulated area. Any change to a regulated area will be reported within 15

days of the change. The reports will contain information required by 29 CFR 1910.1017.

5.0 MONITORING

5.1 AIR

5.1.1 Routine Air Monitoring

Air quality monitoring will be conducted at active site areas including, but not limited to, roadways, decontamination areas, site construction areas, or release areas (known or suspected spills, leaking pipes or vessels, or odors), and other areas where work activities may present a potential for particulate or volatile emissions. Measurements above background levels for organic vapors or dust will be reported to site management. Tables 3A and 3B present the action levels and required responses for VOC and dust releases. Air monitoring results will be maintained onsite.

A hand held organic vapor meter (OVM) will be used to conduct routine air monitoring for VOCs. The OVM may have a photoionization detector (PID) or flame ionization detector (FID).

A hand held dust monitor will be used to conduct routine air monitoring for dust.

Appendix C presents the routine air monitoring procedures.

5.1.2 Event Based Fence Line Air Monitoring

Site management may authorize fence line monitoring when events onsite occur that cause handheld monitoring results to exceed the criteria listed in Table 3A. In general, the procedure calls for a SUMMA canister to be deployed downwind of the event at the fence line. The SUMMA canister collects air for a 24-hour period. The SUMMA canister will be sent to a laboratory for testing for site constituents. The results will be compared to the Brio Site Fence Line Ambient Air Quality Standards (FLAAQS) shown in Table 3C.

Appendix C presents the event based fence line air monitoring procedure.

5.1.3 Scheduled Fence Line Air Monitoring

The scheduled fence line air monitoring consists of concurrently collecting six 24-hour samples at the site perimeter. Figure 6 shows the locations of the air monitoring sample points. After the sample period is complete, the canisters will be sent to a laboratory to be analyzed for site constituents. Results will be compared to FLAAQS shown in Table 3C. Appendix C presents the scheduled fence line air monitoring procedure.

5.1.4 Reporting

Routine air monitoring will be summarized in the Annual Effectiveness Report to the USEPA.

Event based fence line air monitoring results will be reported to the USEPA following receipt and validation of laboratory data and will be summarized in the Annual Effectiveness Report (see Section 6).

The USEPA will be notified if any of the scheduled fence line air monitoring results exceed the FLAAQS as soon as the laboratory reports are validated. These results also appear in the Annual Effectiveness Report to the USEPA. If the FLAAQS are not exceeded for a given sampling event, then the results will only included in the Annual Effectiveness Report to the USEPA.

5.1.5 Schedule

Routine, event based, and scheduled fence line air monitoring is presented in the Brio Site Master Schedule in Table 1.

5.2 SURFACE WATER QUALITY

5.2.1 Surface Water Quality Monitoring Overview

The surface water quality in Mud Gully and Clear Creek represents one measure of the effectiveness of the remedy to contain onsite affected material. Surface water will be sampled at locations defined in Section 5.2.2 and as scheduled in Section 5.2.7.

5.2.2 Sampling Locations and Procedures

Surface water samples will be collected in Mud Gully at sampling locations SW-1, SW-13 and SW-16. A surface water sample will be collected in Clear Creek (SW-21) at approximately 100 yards down stream of the confluence of Mud Gully and Clear Creek. Surface water sampling locations are shown on Figure 3. Surface water sampling procedures are found in Appendix C.

5.2.3 Analytical Testing

Surface water samples will be tested for TCL volatile compounds using USEPA methods

having detection limits that allow an adequate level of detection at the BSTF Surface Water Quality Goals contained in Section 5.2.4.

5.2.4 Surface Water Performance Standards

Table 4 presents the Mud Gully and Clear Creek Surface Water Performance Standards from the Consent Decree.

5.2.5 BSTF Surface Water Quality Goals

Table 4 presents the BSTF Surface Water Quality Goals. Surface water monitoring results will be compared to these levels only for informational purposes as mentioned in the USEPA 2003 Five-Year Review Report. The Surface Water Performance Standards (see Section 5.2.4) are the sole criteria used for compliance.

5.2.6 Reporting

Surface water quality data will be included in the Annual Effectiveness Report.

If the results of a sample event exceed the BSTF Surface Water Performance Standards (presented in Table 4), a report will be prepared and sent to the USEPA.

All surface water quality reporting will contain the following elements:

- Tabulated post-closure analytical data from each sample location
- A figure showing the sample locations
- A comparison of measured surface water quality to the Surface Water Performance Standards (presented in Table 4) for both Mud Gully and Clear Creek.

5.2.7 Schedule

Table 1 presents the Brio Site Master Schedule for the surface water sampling and reporting frequencies.

5.3 GROUNDWATER

5.3.1 NSCZ Plume Management Within the Barrier Wall

Recovery wells screened in the NSCZ are used to maintain an inward groundwater gradient toward the plumes within the barrier wall. Piezometers have been strategically located for

the measurement of NSCZ groundwater elevations. Figure 2 shows the location of the recovery wells and piezometers. The Sampling and Analysis Plan and Quality Assurance/Quality Control Plan located in Appendix C presents the field form used to record the groundwater elevation at each of the piezometers.

During the first year of groundwater recovery activities, NSCZ groundwater elevation data will be obtained and used to assess inward gradient patterns. A separate report will be submitted to the USEPA that presents the data, gradient patterns, and a plan for future compliance monitoring.

NSCZ recovery wells may be abandoned if the groundwater quality meets the Consent Decree Groundwater Performance Standards found in Table 5. This plan currently does not include analytical testing of the NSCZ. A separate abandonment plan will be submitted to the USEPA when the BSTF modifies the plan to include analytical testing and the results meet the Groundwater Performance Standards.

5.3.2 NSCZ Plume Management Outside of the Barrier Wall

5.3.2.1 South Plume – The groundwater barrier wall constructed around Brio-South contained most of the groundwater plume and its source material. However, because of the location of a major pipeline corridor, the barrier wall does not encompass the leading front of the plume. This groundwater plume (termed South Plume) moves slowly (approximately 40 feet per year) and ultimately discharges to Mud Gully. Surface water quality in Mud Gully in the immediate area of the plume discharge has not been adversely impacted as defined by the regulatory standards. However, the Consent Decree requires active treatment for any plume having concentrations above the Groundwater Performance Standards (see Table 5).

Active treatment of the South Plume consists of operating two groundwater recovery wells located within the plume as described in Section 4.1. The two well recovery system will be evaluated after one year of operation. There will be no gradient control monitoring or flow monitoring required in this area. If the surface water quality in this area degrades or approaches the compliance standards, additional measures will be implemented as approved by the USEPA.

5.3.2.2 Cofferdam Plume Management System – The Cofferdam Plume Management System consists of a subsurface sheet pile barrier wall. The barrier wall has been shown to be effective as a barrier to the NCSZ plume. The surface water analytical results are comparable to the results obtained when the plume was managed using continuously pumped NSCZ groundwater wells prior to the installation of the cofferdam.

The six NSCZ groundwater wells (BRW-1, BRW-2, BRW-3, BRW-4, BRW-5, and BMW-7A-1) within the cofferdam are former groundwater recovery wells. At least one well will be configured for pumping operations, should pumping be necessary, to maintain compliance with the Surface Water Performance Standards. This well is referred to as C05 GW. Trends in surface water analytical data may be used to assess an operating schedule (if any) for pumping these wells. The well locations are presented in Figure 2A.

5.3.3 FFSZ Groundwater Quality Monitoring

A five well groundwater monitoring system is maintained in the FFSZ. The five FFSZ groundwater monitoring well locations are shown in Figure 2. The wells (BWM-1B, BMW-2B, BMW-3B, BMW-18B, and DMW-52B) are screened in the upper portion of the FFSZ. Appendix E presents the groundwater monitoring well installation logs.

The FFSZ groundwater has been sampled annually and analyzed for volatile organic compounds (VOC). Previous sampling data support the annual sampling frequency. The results of VOC analyses will be used as an indicator of the possibility of site constituents reaching the FFSZ. Groundwater sampling procedures are presented in Appendix C.

Laboratories will use USEPA drinking water method 524 to analyze the FFSZ groundwater for drinking water VOC constituents. The analytical results will be compared to the USEPA drinking water Maximum Contaminant Levels (MCL) as applicable. The drinking water VOC constituent list and associated MCLs are found in Table 6.

If a monitored VOC constituent exceeds its respective MCL for a single monitoring event in wells BWM-1B, BMW-2B, BMW-3B, or BMW-18B, the affected wells will be analyzed for both drinking water VOCs and drinking water semivolatile compounds (SVOC) at the next annual event. SVOC monitoring ceases when SVOC MCLs are not exceeded. DMW-52B groundwater has been tested for and does not contain SVOCs, therefore, this well will not be scheduled for SVOC analysis if any drinking water VOC MCL is exceeded. The SVOC MCLs are found in Table 6.

If any of the five wells have monitored constituents that exceed the respective MCL for two consecutive monitoring periods, a proposal evaluating the likely cause for the presence of the compound and a proposal of relevant response actions will be sent to the USEPA within 60 days of completion of the validation report.

If all five wells in the monitoring system show no monitored compounds above MCLs for a period of five consecutive years, a petition may be submitted for USEPA review which describes the performance of the monitoring system and request approval to modify or terminate the monitoring program.

5.3.4 REPORTING

A Groundwater Monitoring Report combining the NSCZ gradient control data and the FFSZ water quality data will be included in the Annual Effectiveness Report. The Groundwater Monitoring Report includes:

- NSCZ gradient control data
- A list of the FFSZ wells sampled
- Current and historical tabulated FFSZ analytical results
- A comparison of the FFSZ results to the MCLs
- A figure showing FFSZ and NSCZ well locations
- Field sampling log sheets
- Data validation report
- Conclusions and recommendations (if required)

An individual report will be sent to the USEPA if any of the MCLs are exceeded in the FFSZ water quality data. The report will be sent upon completion of data validation and will include the following:

- A list of the FFSZ wells sampled
- Current and historical tabulated FFSZ analytical results
- A comparison of the FFSZ results to the MCLs
- Field sampling log sheets
- Data validation report
- Conclusions and recommendations

5.3.5 Schedule

Table 1-Brio Site Master Schedule presents the sampling frequency.

5.4 DNAPL

5.4.1 Summary of Post-Closure DNAPL Recovery Program

The post-closure DNAPL recovery plan encompasses the following elements:

- Maintain the same well abandonment criteria for the 13 DNAPL recovery wells as the pre-closure program. Section 10.3 reiterates the same well abandonment procedure
- Install thirteen 2-inch replacement wells at the original piezometer locations to optimize DNAPL production based on proven DNAPL recovery performance. The 13 preclosure DNAPL piezometers (piezometer numbers: 13, 14, 21, 22, 23, 29, 30, 31, 37, 38, 39, 45, and 46) were replaced with 13 DNAPL wells (B01DW, B02DW, B03DW, B04DW, B05DW, B06DW, B07DW, B08DW, B09DW, B10DW, B11DW, B12DW, and B13DW) respectively. Figure 2 shows the location of the 13 installed DNAPL recovery wells.
- Install six fully penetrating NSCZ groundwater recovery wells in the Pit J area to assist in DNAPL recovery. Groundwater recovery wells (B01GW, B02GW, B03GW, B04GW, B05GW, and C02GW) were installed as shown in Figure 2.
- Install suitable pumps to recover DNAPL. Positive displacement pumps have been installed at each of the replacement DNAPL recovery wells to provide the necessary pumping capacity.

5.4.2 DNAPL Recovery Baseline Evaluation Study

Two goals of this study are to:

- Compare the DNAPL production rates of the post-closure recovery wells to the pre-closure piezometer well rates.
- Establish the optimal pumping rate and schedule for each of the new DNAPL wells.

The baseline evaluation process for the 13 DNAPL wells is defined below:

1. Pump test each well at various DNAPL recovery rates to establish the optimal pump rate and schedule.
2. Initiate DNAPL recovery during normal work schedule (M-F 8 AM-3 PM) once the optimal rate and schedule has been defined.
3. Pump test each well one-day per month for 12 months.
4. Estimate the monthly production of each well from each pump test data set.
5. Compare the production rates of pre-closure piezometers to the post-closure wells.
6. Submit the DNAPL Recovery Baseline Evaluation Report to the USEPA.

5.4.3 DNAPL Recovery Well Abandonment Process

The following process is used to identify DNAPL wells that are considered nonproductive and should be considered for abandonment.

1. Wells that produce less than six gallons of DNAPL per month – inform the USEPA.
2. Allow the well to rest for one month.
3. Perform a five-day (minimum 30-hour) pump test.
4. If DNAPL recovery is less than 1.5 gallons, allow the well to rest for six months.
5. Perform a five-day (minimum 30-hour) pump test.
6. If DNAPL recovery is less than 1.5 gallons, submit a request for abandonment to the USEPA.
7. Abandon the well after site management has received approval from the USEPA.
8. A plugging and abandonment report will be prepared once the well has been abandoned.

Wells will be abandoned in accordance with state guidelines.

5.4.4 Reporting

A report(s) will be sent to the USEPA covering:

- DNAPL Recovery Baseline Evaluation Study (included in Annual Effectiveness Report)
- DNAPL Recovery Well Abandonment Report

5.4.5 Schedule

The Baseline Evaluation Study and DNAPL Recover Well Abandonment report(s) are scheduled as shown in Table 1.

6.0 ANNUAL EFFECTIVENESS REPORT

The Annual Effectiveness Report will be submitted annually, starting one year into the post-closure period.

The goal of the Annual Effectiveness Report is to evaluate the long-term performance of the remedy. In addition, this report fulfills the requirements for Quality Assurance Reports and periodic update reports. The report will contain the following elements:

1. Verification that site conditions have not changed and that there has been no land use or development that may affect the remedial action.
2. Recommendations for modifying the Post-Closure MOM Plan.
3. A summary the findings of the monitoring activities (surface water, FFSZ groundwater, NSCZ groundwater gradient control, water treatment plant discharge, air monitoring, and DNAPL recovery performance)
4. A comparison of the media performance to compliance performance standards
5. A summary of field and analytical quality data
6. A summary of health and safety statistics/incidences
7. A summary of emergency actions
8. Note worthy items of EPA interest

The following information will be used to prepare the Annual Effectiveness Report:

- Site Inspections (BSTF files)
- Site Maintenance Check Lists (BSTF files)
- Surface Water Quality (BSTF reports)
- DNAPL Collection and Disposal (BSTF reports)
- DNAPL Recovery Baseline Evaluation (BSTF reports)
- DNAPL Recovery Well Abandonment (for each well(s) abandoned) (BSTF reports)
- Routine Air Monitoring (BSTF files)
- Event Based Fence Line Air Monitoring (BSTF reports)
- Semiannual Fence Line Air Monitoring (BSTF reports)
- NSCZ Groundwater Gradient Control Data (BSTF files)
- FFSZ Groundwater Quality Report (BSTF reports)
- WTP Discharge Water Quality Data (BSTF files)
- Cover Gas Collection Results (BSTF files)

7.0 OTHER SITE PLANS

7.1 WORKER HEALTH AND SAFETY

All post closure activities shall be in accordance with CFR 1910.120 Hazardous Waste Operations and Emergency Response.

It is the BSTF's policy to do everything reasonable to protect personnel, property, and the public from the results of accidents. The Worker Health and Safety Plan contains standard operating procedures for potentially hazardous activities.

The Worker Health and Safety Plan is a separate document.

7.2 SPILL AND VOLATILE EMISSIONS RELEASE CONTINGENCY/ EMERGENCY NOTIFICATION PLAN

The purpose of the Spill and Volatile Emissions Release Contingency / Emergency Notification Plan (SVERCP/ENP) is to provide procedures for coordinated response by site personnel and outside agencies to spills, volatile emission releases, or accidental discharges of hazardous materials. The plan covers these events whether onsite or offsite, into the air, soils, or waters adjacent to the site, and roadways over which waste material is to be transported. The response will be directed to protect the environment and public health and welfare.

It is also the purpose of the plan to outline methods by which spills and accidental discharges will be reported to Federal and State agencies that have regulatory responsibility over activities and/or facilities involved in spills and accidental discharges.

The Spill and Volatile Emissions Release Contingency / Emergency Notification Plan is a separate document.

7.3 COMMUNITY RELATIONS PLAN

The BSTF has developed a Community Relations Plan that has been approved by the USEPA. The Community Relations Plan includes maintaining a public repository where copies of Brio Site Annual Effectiveness Reports (Section 6.0) will be maintained. The Community Relations Plan is contained in Appendix H.

TABLE 1
BRIO SITE MASTER SCHEDULE

ACTIVITY	SECTION	DAILY	WEEKLY	MONTHLY	QUARTERLY	ANNUAL	SEMIANNUAL	AS NEEDED	NOTES
Inspections	2.0								
Roads, Gates, Fences, Signs	2.2.1	X							
NSCZ Recovery Wells and Piezometers	2.2.5.4	X							
FFSZ Monitor Wells	2.2.5.4	X							
Cover	2.2.2	X							
Site Drainage and Erosion Control	2.2.3	X							
Barrier Wall	2.2.4	X							
Water Treatment Plant	2.2.5.1	X							
Groundwater Collection Hub Facilities	2.2.5.2	X							
Safety Relief Devices	2.2.5.3					X			
Underground Utilities	2.2.5.4	X							
Gas Recover and Collection System Yr. 1	2.2.6	X							
Mud Gully	2.2.7	X							
Site Safety Inspections	2.2	X							

TABLE 1 (Continued)
BRIO SITE MASTER SCHEDULE

ACTIVITY	SECTION	DAILY	WEEKLY	MONTHLY	QUARTERLY	ANNUAL	SEMIANNUAL	AS NEEDED	NOTES
Maintenance	3.0								
Onsite Access Roads	3.1.2							X	
NSCZ Recovery Wells and Piezometers	3.1.5.5							X	
FFSZ Monitor Wells	3.1.5.5							X	
Cover	3.1.3							X	
Barrier Wall	3.1.4							X	
Water Treatment Plant	3.1.5.1							X	
Groundwater Collection Hub Facilities	3.1.5.2							X	
Safety Relief Devices	3.1.5.3							X	
Underground Utilities	3.1.5.4							X	
Gas Recover and Collection System Yr. 1	3.1.6.1							X	
Gas Recover and Collection System Post Yr. 1	3.1.6.2							X	
Mud Gully	3.1.7							X	
Safety Equipment	3.1.8							X	

TABLE 1 (Continued)
BRIO SITE MASTER SCHEDULE

ACTIVITY	SECTION	DAILY	WEEKLY	MONTHLY	QUARTERLY	ANNUAL	SEMIANNUAL	AS NEEDED	NOTES
Operations and Monitoring	4.0-5.0								
Treated Water Sampling	4.1.2							X	
Gas Recover and Collection System Yr. 1	4.3.3	Per	Pilot	Study	Results				
Gas Recover and Collection System Post Yr. 1	4.3.4	Per	Yr. 1	Results					
Routine Air Monitoring	5.1.1	X							
Event Based Air Monitoring	5.1.2							X	
Scheduled Fence Line Air Monitoring	5.1.3						X		
Surface Water Sampling	5.2				X				
NSCZ Gradient Control Monitoring	5.3.1-5.3.2		X						
FFSZ Groundwater Sampling	5.3.3					X			
DNAPL Recovery Baseline Evaluation Study	5.4.2			1st year for 12 months					
DNAPL Recovery	4.2	X							
DNAPL Disposal	4.2.1							X	

TABLE 1 (Continued)
BRIO SITE MASTER SCHEDULE

ACTIVITY	SECTION	DAILY	WEEKLY	MONTHLY	QUARTERLY	ANNUAL	SEMIANNUAL	AS NEEDED	NOTES
Reporting	2.0-6.0								
Inspection	2.3	X				(AER)			1
Maintenance	3.2.7					(AER)		X	1
Cover Compartment Gas Collection	4.3.4					(AER)			
All Air Monitoring	5.1.4	X				(AER)		X	1, 2, 3
Surface Water	5.2.6					(AER)			4
WTP Discharge Water Quality	4.1.2.4					(AER)			1
NSCZ Gradient Control Monitoring	5.3.3					(AER)			
FFSZ Groundwater Monitoring	5.3.3					(AER)			5
DNAPL Baseline Evaluation	5.4.2					(AER)		X	
DNAPL Recovery System	4.2.4					(AER)		X	6
DNAPL Recovery Well Abandon. Report	5.4.4					(AER)		X	
Areas Regulated for Vinyl Chloride	4.4.2							X	7
Annual Effectiveness Report (AER)	6.3					X			
Emergency Notification	7.2					(AER)		X	

1. Routine reports filed onsite. Results summarized in AER
2. Event based air monitoring report sent to USEPA after data validation. Results summarized in AER
3. Scheduled air monitoring - if FLAAQS are exceeded, report to USEPA after data validation - otherwise full report in AER
4. If Surface Water Performance Standards are exceeded, report to USEPA after data validation - otherwise full report in AER
5. If MCLs are exceeded, report to USEPA after data validation - otherwise full report in AER
6. A report/manifest will be sent to the Texas Commission on Environmental Quality (TCEQ) for each DNAPL shipment
7. Report to OSHA Area Director within one month following the establishment of a regulated area. As needed thereafter

TABLE 2
TREATED WATER DISCHARGE CRITERIA

PARAMETER	DISCHARGE LIMIT (mg/l)	PQL (mg/l)
General Chemistry		
pH	6.0-9.0 (units)	n/a
BOD	81	5
COD	568	20
Sulfur (Sulfide)	0.6	0.2
Phosphorus	4	0.1
Ammonia as N	23	4
Oil and Grease	31	10
Phenolics	0.7	0.2
TSS	62	5
Metals		
Copper	0.093	0.010
Volatiles		
1, 1, 2-Trichloroethane	0.054	0.010
1, 2-Dichloroethane	0.211	0.010
Vinyl Chloride	0.268	0.010
Methylene Chloride	0.089	0.010
Semivolatiles		
Bis(2-chloroethyl)ether	0.757	0.020
Total Carcinogenic PNAs[1]	0.350 (total)	0.020 (each)
Total Noncarcinogenic PNAs[2]	0.470 (total)	0.020 (each)

1. Benzo(a)anthracene
   Benzo(b)fluoranthene
   Benzo(k)fluoranthene
   Benzo(a)pyrene
   Dibenzo(a,h)anthracene
   Indeno(1,2,3,c,d)pyrene

2. Acenaphthene
   Anthracene
   Chrysene
   Fluoranthene
   Fluorene
   Naphthalene
   Phenanthrene
   Pyrene

TABLE 3A
VOLATILE EMISSION RESPONSE

LOCATION	ACTION LEVEL	RESPONSE [4]
Immediate Work or Release Area	5 muab[1] above background for 15 seconds[2]	Mitigate release and notify project manager
Immediate Work or Release Area	1 muab above background for 1 minute[2]	Mitigate release and notify project manager
Fence Line	1 muab above background for 5 minutes[3]	Mitigate release and notify project manager

1. muab = measurement unit above background.
2. WHASP Section 4.1.3.
3. ROP AQMS Performance Criteria Table 5 and the Spill/Volatile Emission Release. Contingency Plan and Emergency Notification Plan (SVERCP/ENP) Section 4.2.3.
4. Mitigation per WHASP and SVRCP/ENP procedures.

TABLE 3B
DUST EMISSION RESPONSE

ACTION LEVEL	RESPONSE
5 mg/m^3 sustained for 60 seconds [1]	Mitigate release [2]

1. 1/2 the ACGIH TLV of 10 mg/m^3 - WHASP Section 4.2.1
2. Corrective action is at the direction of the project manager, health and safety administrator, site construction manager, or quality assurance officer.

TABLE 3C
FENCELINE AMBIENT AIR QUALITY STANDARDS (FLAAQS)

COMPOUND	FLAAQS (24-HOUR AVERAGE-ppb)
Benzene	50
1, 2-Dichloroethane (Ethylene Dichloride)	200
Methylene Chloride	1100
1, 1, 2-Trichloroethane	656
Vinyl Chloride	690

TABLE 4
SURFACE WATER PERFORMANCE STANDARDS AND QUALITY GOALS

	SURFACE WATER PERFORMANCE STANDARDS		BSTF SURFACE WATER QUALITY GOALS*	
Compound	**Mud Gully (µg/ l)**	**Clear Creek (µg/ l)**	**Mud Gully (µg/ l)**	**Clear Creek (µg/ l)**
1, 1, 2-Trichloroethane	4,180	41.8	3020	302
1, 2-Dichloroethane	20,000	1,794	739	73.9
1, 1-Dichloroethene	8,740	87.4	58.4	5.84
Vinyl Chloride	9,450	94.5	4150	415

*These levels are based on the Texas Commission on Environmental Quality (TCEQ) surface water quality standards as adopted in August 2002, and based on calculations presented in the Texas Total Maximum Daily Load (TMDL) Program.

TABLE 5
NSCZ GROUNDWATER
PERFORMANCE STANDARDS

PARAMETER	CRITERIA (mg/ l)
1, 1, 2-Trichloroethane	4.18
1, 2-Dichloroethane	20.00
1, 1-Dichloroethene	8.74
Vinyl Chloride	9.45

TABLE 6
FFSZ GROUNDWATER DRINKING WATER LIST AND MAXIMUM CONTAMINANT LEVELS (MCL)

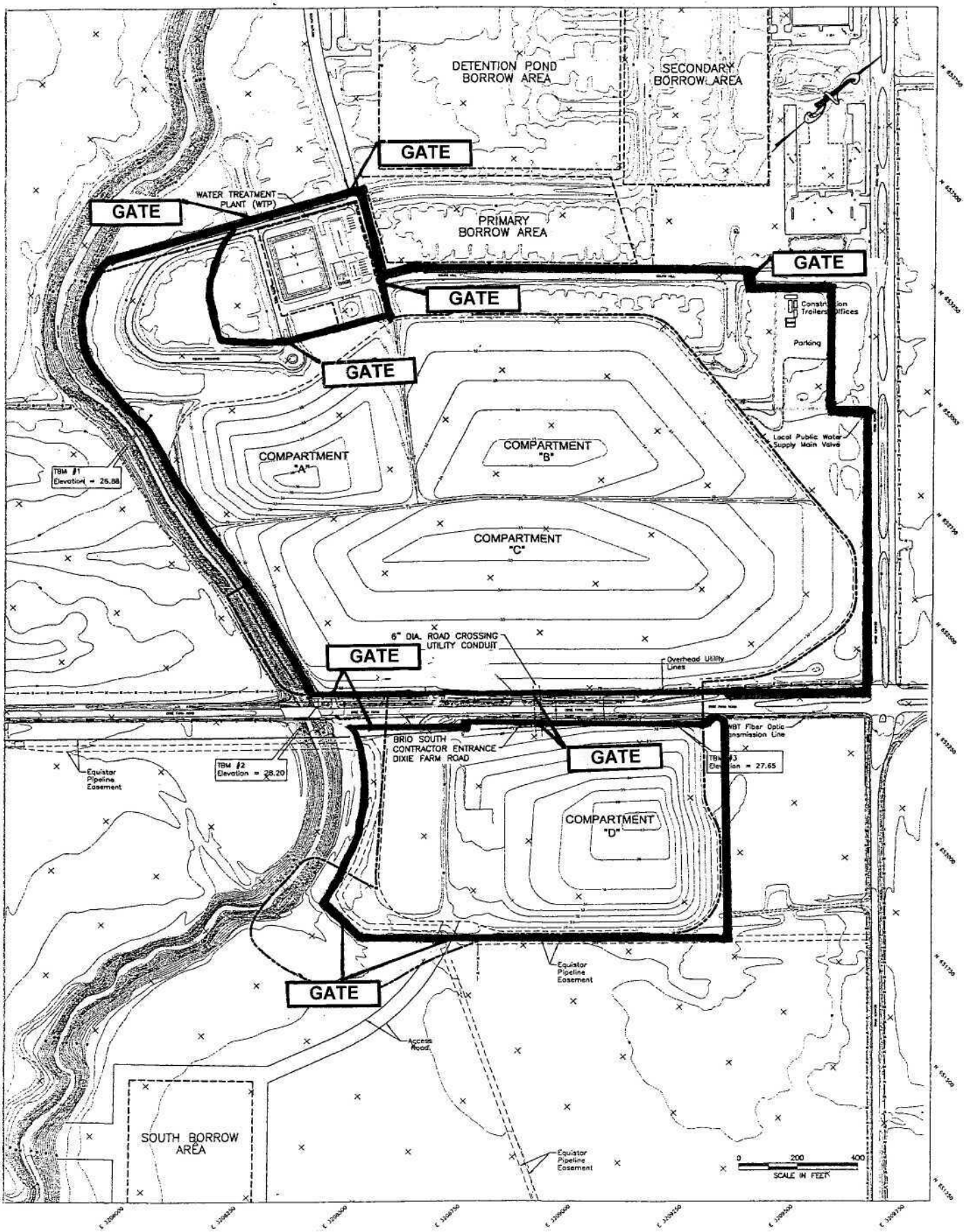
DRINKING WATER VOLATILE LIST	MCL (µg/ l)
Benzene	5
Carbon Tetrachloride	5
Chlorobenzene	100
1, 2-Dichlorobenzene (o-dichlorobenzene)	600
1, 4-Dichlorobenzene (p-dichlorobenzene)	75
1, 2-Dichloroethane	5
1, 1-Dichloroethene	7
cis-1, 2-Dichloroethene	70
trans-1, 2-Dichloroethene	100
Methylene Chloride (Dichloromethane)	5
1, 2-Dichloropropane	5
Ethylbenzene	700
Styrene	100
Tetrachloroethene	5
Toluene	1000
1, 2, 4-Trichlorobenzene	70
1, 1, 1-Trichloroethane	200
1, 1, 2-Trichloroethane	5
Trichloroethene	5
Vinyl Chloride	2
Xylenes (Total)	10000
Total trihalomethanes (TTHMs) *	100

* Total trihalomethanes = Chloroform, Bromodichloromethane, Bromoform, and Dibromochloromethane

TABLE 6 (Continued)

DRINKING WATER SEMIVOLATILE LIST [1]	MCL (µg/ l)
Benzo(a)pyrene (PAHs)	0.2
bis(2-Ethylhexyl)phthalate [2]	6
Hexachlorobenzene	1
Hexachlorocyclopentadiene	50
Pentachlorophenol	1

1. Excluding pesticides, herbicides, and PCBs
2. Also known as di(2-Ethylhexyl)phthalate

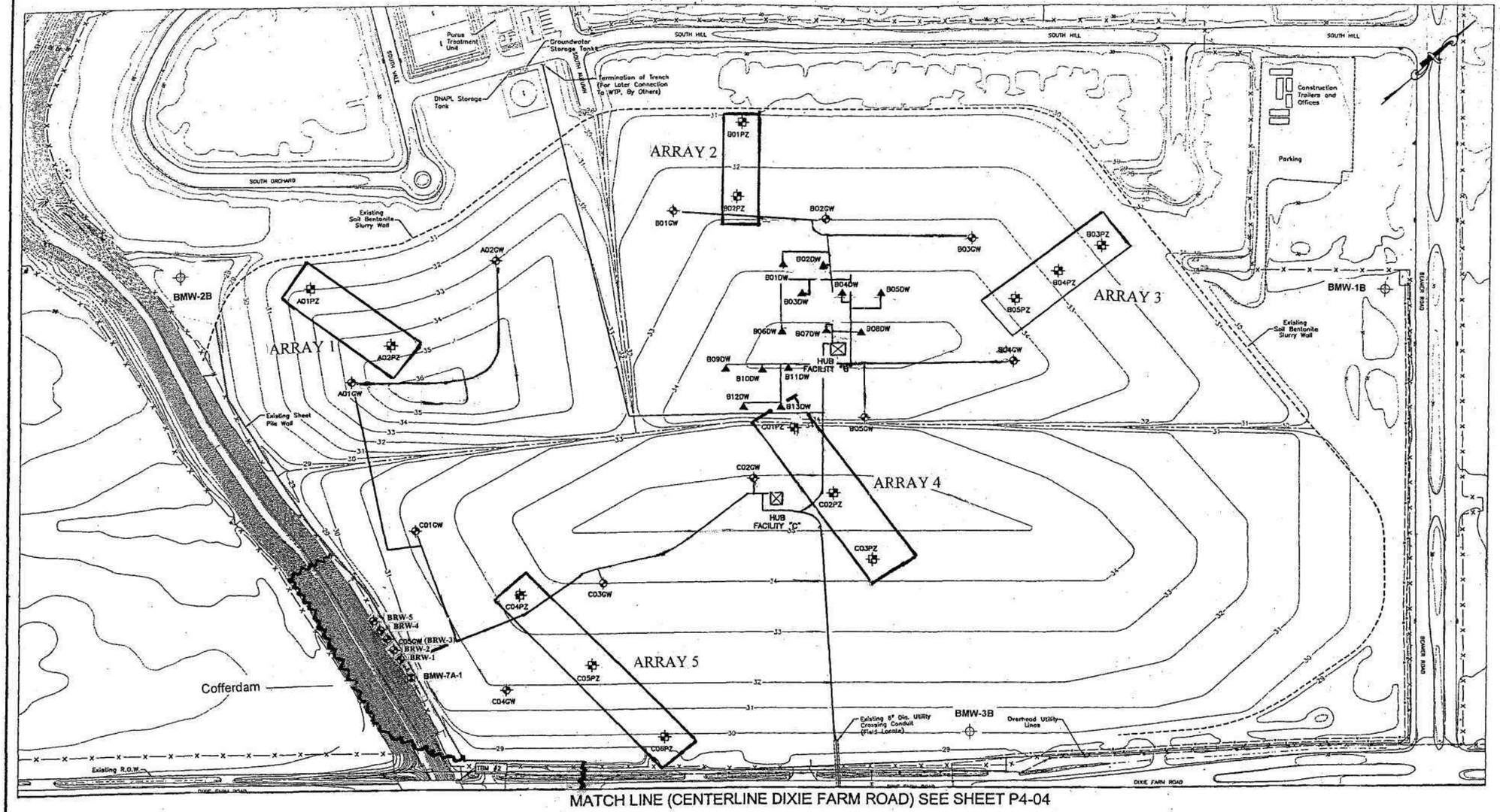


FENCELINE

BRIO SITE TASK FORCE
BRIO SITE FENCELINE

FIGURE 1

002071



MATCH LINE (CENTERLINE DIXIE FARM ROAD) SEE SHEET P4-04

NOTES

1. SEE DRAWING P4-01 FOR TEMPORARY BENCHMARK (TBM) DESCRIPTIONS.
2. WELL AND PIEZOMETER INSTALLATION WILL TAKE PLACE BETWEEN THE ROUGH GRADING AND FINAL GRADING PHASES OF THE COVER CONSTRUCTION (BY OTHERS). WELL COMPLETION, PIPING RUNS AND HUB FACILITY CONSTRUCTION WILL OCCUR AFTER COVER PLACEMENT.
3. GROUND SURFACE CONTOURS REFLECT THE ROUGH GRADING ELEVATIONS AT THE TIME OF WELL INSTALLATION. GEOSYNTHETIC MATERIAL AND FINAL GRADING SOILS WILL BE PLACED (BY OTHERS) PRIOR TO TRENCHING AND PIPING INSTALLATION.
4. COLLECTION/TRANSFER TRENCHES SHOWN REPRESENT THE GENERAL ALIGNMENT RELATED TO THE WELLS, HUB FACILITIES AND THE WTP PLANT. DETAILED TRENCH PIPING IS INCLUDED ON DRAWINGS P4-13 TO P4-15.
5. DRILL CUTTINGS SHALL BE COLLECTED AND STABILIZED WITH FLYASH OR PORTLAND CEMENT UNTIL A FIRM TO STIFF CONSISTENCY IS REACHED. THE BSTF WILL IDENTIFY ONSITE STOCKPILE AREAS (WITHIN THE VERTICAL BARRIER WALL) FOR PLACEMENT OF STABILIZED DRILL CUTTINGS.
6. CAP WELLS AT COMPLETION OF INSTALLATION AND WELL DEVELOPMENT ACTIVITIES. WELLS SHALL REMAIN CAPPED UNTIL COLLECTION PUMPS ARE INSTALLED.

LEGEND

- ELEVATION CONTOUR
- DEPRESSION
- FENCE
- EASEMENTS
- EXISTING SOIL BENTONITE SLURRY WALL
- EXISTING SHEET PILE WALL
- OVERHEAD UTILITY LINES
- SWBT FIBER TRANSMISSION LINE
- WATER LINE
- COLLECTION/TRANSFER PIPING TRENCH
- UNDERGROUND CONDUIT
- STRUCTURES
- PIEZOMETERS
- GROUNDWATER COLLECTION WELLS
- DNAPL COLLECTION WELLS
- HUB FACILITY
- FFSZ GROUNDWATER MONITORING WELLS
- ARRAY

0 100 200
SCALE IN FEET

HUB A

ID No.	DESCRIPTION	COORDINATES	
		NORTHING	EASTING
HUB A	NE CORNER OF BLDG	651,282.31	3,206,589.06
HUB A	SW CORNER OF BLDG	651,248.43	3,206,591.06
A01GW	GW WELL	651,153.28	3,206,457.53
A02GW	GW WELL	651,518.18	3,206,466.45
A01PZ	PIEZOMETER	651,218.71	3,206,268.66
A02PZ	PIEZOMETER	651,257.00	3,206,453.82

HUB B

ID No.	DESCRIPTION	COORDINATES	
		NORTHING	EASTING
HUB B	NE CORNER OF BLDG	651,911.28	3,207,040.21
HUB B	SW CORNER OF BLDG	651,874.41	3,207,039.55
B01GW	GW WELL	651,831.75	3,206,623.47
B02GW	GW WELL	652,043.95	3,206,833.31
B03GW	GW WELL	650,030.88	3,207,051.28
B04GW	GW WELL	652,131.90	3,207,285.10
B05GW	GW WELL	651,841.38	3,207,175.51
B01PZ	PIEZOMETER	652,044.26	3,206,587.20
B02PZ	PIEZOMETER	651,944.23	3,206,687.84
B03PZ	PIEZOMETER	652,406.69	3,207,227.16
B04PZ	PIEZOMETER	652,312.10	3,207,209.84
B05PZ	PIEZOMETER	652,216.25	3,207,196.10
B01DW	DNAPL WELL	651,925.14	3,20,6846.76
B02DW	DNAPL WELL	651,980.67	3,206,898.00

HUB B (CONT'D)

ID No.	DESCRIPTION	COORDINATES	
		NORTHING	EASTING
B03DW	DNAPL WELL	651914.59	3206913.28
B04DW	DNAPL WELL	651971.60	3206963.25
B05DW	DNAPL WELL	652027.43	3207013.38
B06DW	DNAPL WELL	651838.83	3206943.91
B07DW	DNAPL WELL	651901.42	3206997.56
B08DW	DNAPL WELL	651947.37	3207045.18
B09DW	DNAPL WELL	651704.50	3206942.32
B10DW	DNAPL WELL	651758.26	3206974.10
B11DW	DNAPL WELL	651798.24	3207005.81
B12DW	DNAPL WELL	651681.51	3207005.14
B13DW	DNAPL WELL	651736.50	3207054.41

HUB C

ID No.	DESCRIPTION	COORDINATES	
		NORTHING	EASTING
HUB C	NE CORNER OF BLDG	651,626.34	3,207,183.13
HUB C	SW CORNER OF BLDG	651,592.46	3,207,185.13
C01GW	GW WELL	651,246.54	3,207,080.20
C02GW	GW WELL	650,970.08	3,207,114.35
C03GW	GW WELL	651,246.54	3,207,080.20
C04GW	GW WELL	650,970.08	3,207,114.35
C05GW	GW WELL	650,865.13	3,206,883.82
C01PZ	PIEZOMETER	651,729.17	3,207,101.85
C02PZ	PIEZOMETER	651,698.00	3,207,248.01
C03PZ	PIEZOMETER	651,666.89	3,207,396.33
C04PZ	PIEZOMETER	651,114.30	3,206,992.16
C05PZ	PIEZOMETER	651,123.49	3,207,187.37
C06PZ	PIEZOMETER	651,133.76	3,207,388.84

BRIO SITE TASK FORCE
2501 DIXIE FARM ROAD
HOUSTON, TEXAS 77089

WELL AND HUB FACILITY LOCATION PLAN
BRIO-NORTH

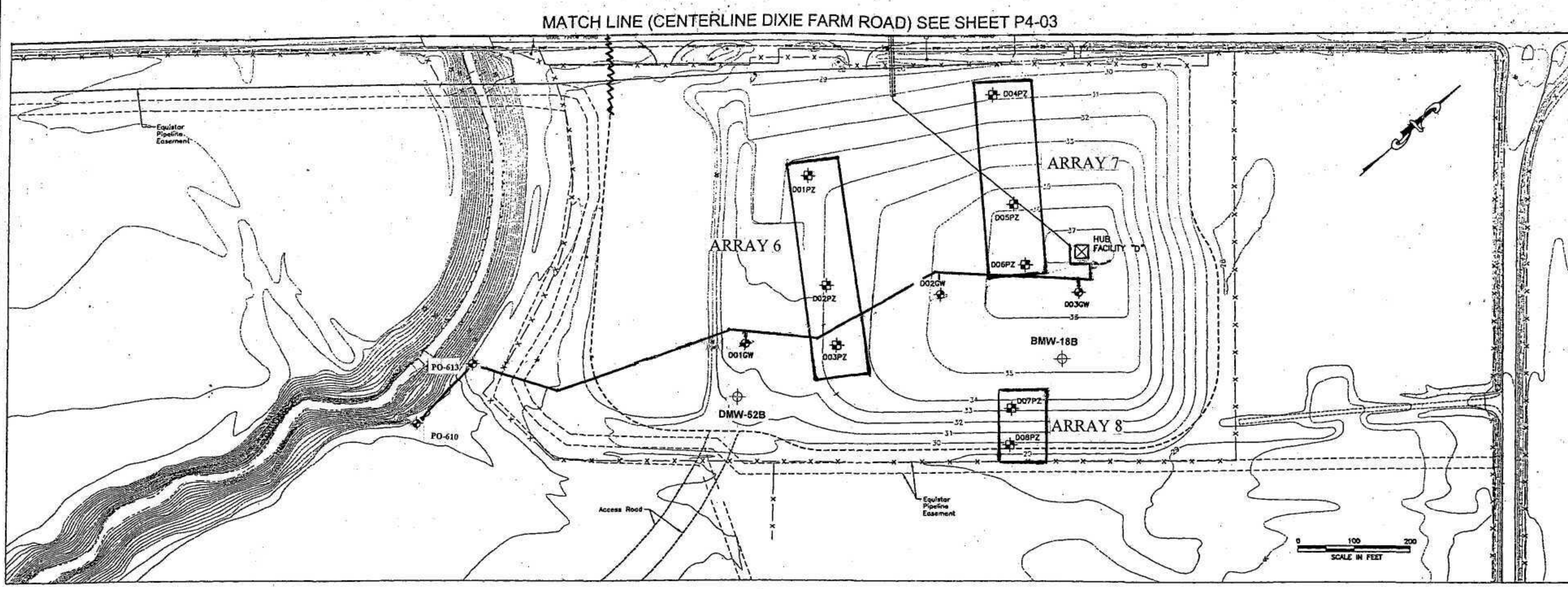
BRIO SUPERFUND SITE - HOUSTON, TEXAS

FIGURE 2A

REVISION: 1
PROJECT 4600000010
DRAWING P4-03

FILENAME: P4-02 (WELL LOCATION - NORTH).dwg
PLOT: L:\2000\00010\00\Drawings\Design Package 4 (Groundwater Recovery)\Phase 1 Only\

002072



HUB D			
ID No.	DESCRIPTION	COORDINATES	
		NORTHING	EASTING
HUB D	NE CORNER OF BLDG	651,340.73	3,208,210.35
HUB D	SW CORNER OF BLDG	651,306.85	3,208,212.35
D01GW	GW WELL	650,758.74	3,207,930.21
D02GW	GW WELL	651,082.25	3,208,098.90
D03GW	GW WELL	651,271.12	3,208,262.94
D01PZ	PIEZOMETER	651,044.39	3,207,780.60
D02PZ	PIEZOMETER	650,940.74	3,207,951.66
D03PZ	PIEZOMETER	650,882.89	3,208,046.04
D04PZ	PIEZOMETER	651,387.84	3,207,892.07
D05PZ	PIEZOMETER	651,287.71	3,208,065.40
D06PZ	PIEZOMETER	651,231.67	3,208,160.82
D07PZ	PIEZOMETER	651,040.22	3,208,341.90
D08PZ	PIEZOMETER	650,993.72	3,208,390.65

NOTES

1. SEE DRAWING P4-01 FOR TEMPORARY BENCHMARK (TBM) DESCRIPTIONS.
2. WELL AND PIEZOMETER INSTALLATION WILL TAKE PLACE BETWEEN THE ROUGH GRADING AND FINAL GRADING PHASES OF THE COVER CONSTRUCTION (BY OTHERS). WELL COMPLETION, PIPING RUNS AND HUB FACILITY CONSTRUCTION WILL OCCUR AFTER COVER PLACEMENT.
3. GROUND SURFACE CONTOURS REFLECT THE ROUGH GRADING ELEVATIONS AT THE TIME OF WELL INSTALLATION. GEOSYNTHETIC MATERIAL AND FINAL GRADING SOILS WILL BE PLACED (BY OTHERS) PRIOR TO TRENCHING AND PIPING INSTALLATION.
4. COLLECTION/TRANSFER TRENCHES SHOWN REPRESENT THE GENERAL ALIGNMENT RELATED TO THE WELLS, HUB FACILITIES AND THE WTP PLANT. DETAILED TRENCH PIPING IS INCLUDED ON DRAWING P4-16.
5. DRILL CUTTINGS SHALL BE COLLECTED AND STABILIZED WITH FLYASH OR PORTLAND CEMENT UNTIL A FIRM TO STIFF CONSISTENCY IS REACHED. THE BSTF WILL IDENTIFY ONSITE STOCKPILE AREAS (WITHIN THE VERTICAL BARRIER WALL) FOR PLACEMENT OF STABILIZED DRILL CUTTINGS.
6. CAP WELLS AT COMPLETION OF INSTALLATION AND WELL DEVELOPMENT ACTIVITIES. WELLS SHALL REMAIN CAPPED UNTIL COLLECTION PUMPS ARE INSTALLED.

LEGEND

- ELEVATION CONTOUR
- DEPRESSION
- FENCE
- EASEMENTS
- EXISTING SOIL BENTONITE SLURRY WALL
- EXISTING SHEET PILE WALL
- OVERHEAD UTILITY LINES
- SWBT FIBER TRANSMISSION LINE
- WATER LINE
- COLLECTION/TRANSFER PIPING TRENCH
- UNDERGROUND CONDUIT
- STRUCTURES
- PIEZOMETERS
- GROUNDWATER COLLECTION WELLS
- HUB FACILITY
- FFSZ GROUNDWATER MONITORING WELLS
- ARRAY

BRIO SITE TASK FORCE
2501 DIXIE FARM ROAD
HOUSTON, TEXAS

WELL AND HUB FACILITY LOCATION PLAN
BRIO-SOUTH

BRIO SUPERFUND SITE - HOUSTON, TEXAS

REVISION: 1

PROJECT 4600000010

DRAWING P4-04

FIGURE 2B

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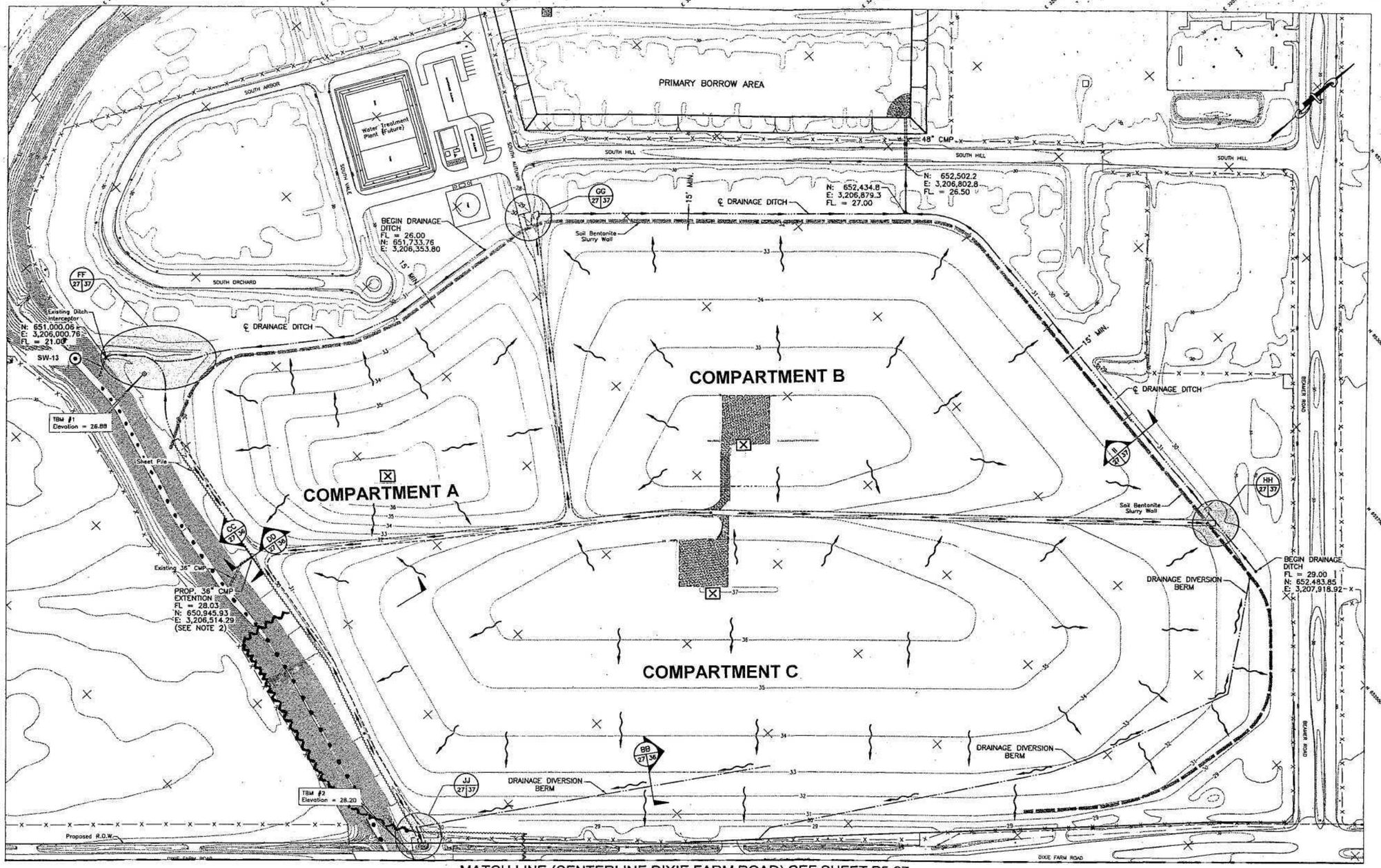


MATCH LINE (CENTERLINE DIXIE FARM ROAD) SEE SHEET P5-27

0 100 200
SCALE IN FEET

NOTES

1. DRAINAGE DIVERSION BERMS TO BE FIELD LOCATED AND SHALL LIMIT SHEET FLOW TO DIXIE FARM ROAD TO LESS THAN 150 FEET OUTSIDE OF THE PROPOSED DIXIE FARM ROAD RIGHT-OF-WAY.
2. FIELD LOCATE EXISTING 36" CMP. TORCH CUT OPENING IN SHEET PILE WALL AND EXTEND 36" CMP AS SHOWN ON SHEET 36.
3. ALL ON SITE DRAINAGE DITCHES TO HAVE A MINIMUM SLOPE OF 0.1%.

LEGEND

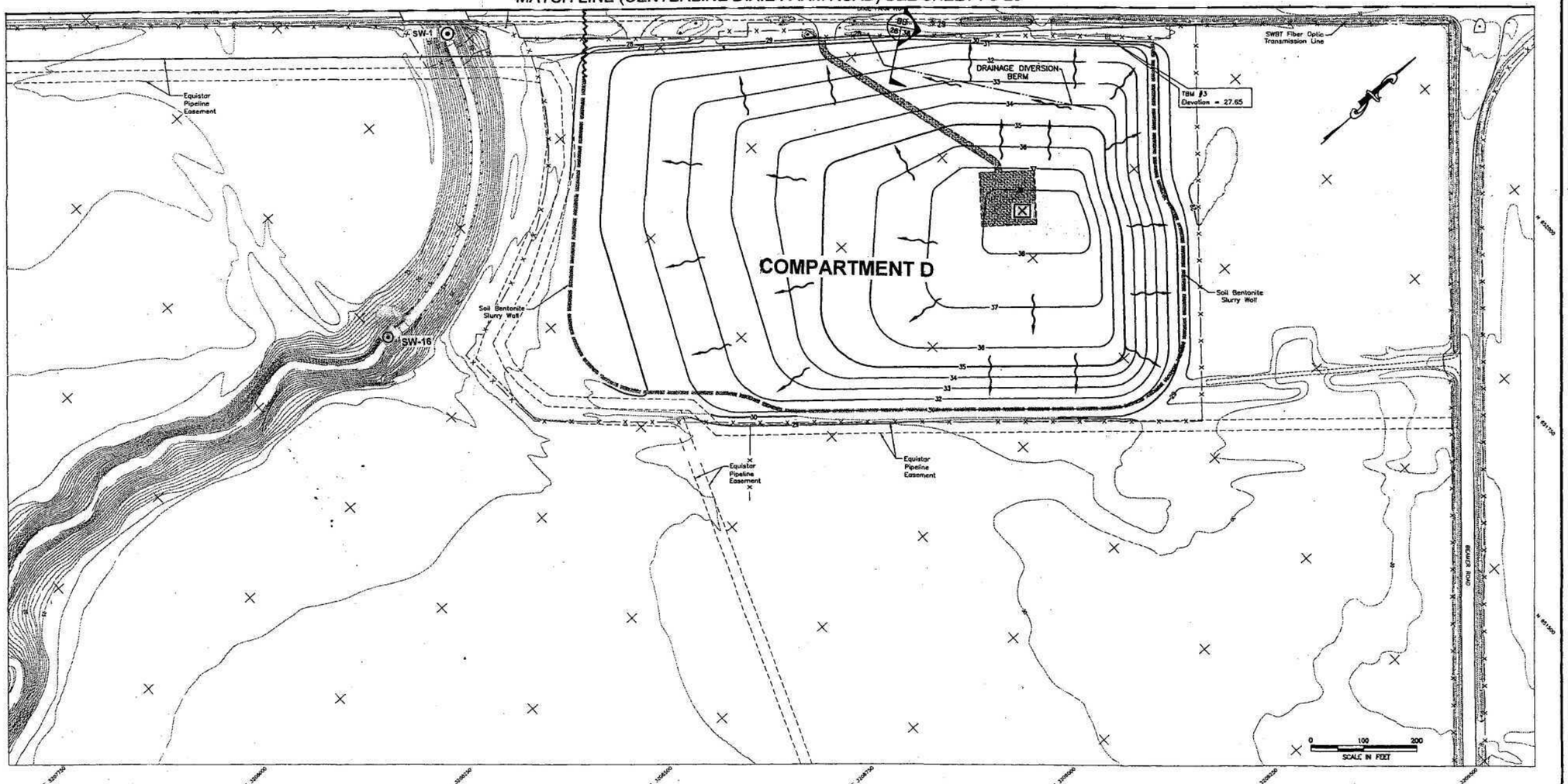
- INDEX CONTOUR (5' INTERVAL)
- INTERMEDIATE CONTOUR (1' INTERVAL)
- DEPRESSION
- DITCH, STREAM, SWALE
- FENCE
- EASEMENTS
- SHEET PILE
- EXISTING SOIL BENTONITE SLURRY WALL
- OVERHEAD UTILITY LINES
- SWBT FIBER TRANSMISSION LINE
- WATER LINE
- PROPOSED CONCRETE PAVING
- DRAINAGE DIVERSION BERM
- OVER LAND FOLW
- CHANNEL FLOW
- PROPOSED GRAVEL ACCESS ROAD
- SURFACE WATER SAMPLE POINTS
- MUD GULLY IMPROVEMENTS
- GAS COLLECTION VENT

	BRIO SITE TASK FORCE 2501 DIXIE FARM ROAD HOUSTON, TEXAS 77089	**SITE DRAINAGE PLAN AND SURFACE WATER SAMPLE LOCATIONS** **BRIO-NORTH**	BRIO SUPERFUND SITE - HOUSTON, TEXAS **FIGURE 3A**	REVISION: 2 PROJECT 4600000010 DRAWING P5-26

002074

PLOT # 28 DRAWING NAME: P5-26 (SURFACE WATER).DWG

MATCH LINE (CENTERLINE DIXIE FARM ROAD) SEE SHEET P5-26



NOTES

1. DRAINAGE DIVERSION BERMS TO BE FIELD LOCATED AND SHALL LIMIT SHEET FLOW TO DIXIE FARM ROAD TO LESS THAN 150 FEET OUTSIDE OF THE PROPOSED DIXIE FARM ROAD RIGHT-OF-WAY.

LEGEND

- INDEX CONTOUR (5' INTERVAL)
- INTERMEDIATE CONTOUR (1' INTERVAL)
- DEPRESSION
- DITCH, STREAM, SWALE
- FENCE
- EASEMENTS
- SHEET PILE
- EXISTING SOIL BENTONITE SLURRY WALL
- OVERHEAD UTILITY LINES
- SWBT FIBER TRANSMISSION LINE
- WATER LINE
- DRAINAGE DIVERSION BERM
- OVER LAND FOLW
- CHANNEL FLOW
- PROPOSED GRAVEL ACCESS ROAD
- SURFACE WATER SAMPLE POINTS
- GAS COLLECTION VENT

BRIO SITE TASK FORCE

2501 DIXIE FARM ROAD
HOUSTON, TEXAS 77089

SITE DRAINAGE PLAN AND SURFACE WATER SAMPLE LOCATIONS
BRIO-SOUTH

BRIO SUPERFUND SITE - HOUSTON, TEXAS

FIGURE 3B

REVISION: 1
PROJECT 4600000010
DRAWING P5-27

DRAWING NAME: P5-04 (SITE PLAN).DWG
PLOT: 1:33 Thu, 10:49 AM JUL 13, 2000

Figure 4

ANALYTICAL SUMMARY

Laboratory Name

Reported On:

Client Name: Brio Site Task Force
Sample Name:
Client ID:
Project: Brio Treated Water

Work Order:
Date Collected:
Matrix: Water
Date Received:

PARAMETER	DISCHARGE LIMIT (mg/L)	METHOD	PQ LIMITS (mg/L)	RESULTS (mg/L)
METALS				
Copper	0.074		0.010	
CONVENTIONAL CHEMISTRIES				
Phenol	0.7		0.2	
Biochemical Oxygen Demand	81		5.0	*
Chemical Oxygen Demand	568		20	
Sulfide	0.6		0.2	
Phosphorus (Total)	4		0.1	
Ammonia (N)	23		4.0	
Oil and Grease	31		10	
Total Suspended Solids	62		5.0	
pH	6-9			
VOLATILES				
1,2-Dichloroethane	0.211		0.010	
Methylene Chloride	0.089		0.010	
1,1,2-Trichloroethane	0.054		0.010	
Vinyl Chloride	0.268		0.010	

J = Compound is present, but below the PQL.
B = Compound is also found in blank.
* = BOD result is not available due to length of analysis.

ANALYTICAL SUMMARY

Laboratory Name

Reported On:

Client Name: Brio Site Task Force
Sample Name:
Client ID:
Project: Brio Treated Water

Work Order:
Date Collected:
Matrix: Water
Date Received:

PARAMETER	DISCHARGE LIMIT (mg/L)	METHOD	PQ LIMITS (mg/L)	RESULTS (mg/L)
SEMIVOLATILES				
Bis(2-chloroethyl)ether	0.757		0.020	
Total Carcinogenic PNAs	0.350			
Benzo (a) anthracene			0.010	
Benzo (b) fluoranthene			0.010	
Benzo (k) fluoranthene			0.010	
Benzo (a) pyrene			0.010	
Dibenzo (a,h) anthracene			0.010	
Indeno (1,2,3-cd) pyrene			0.010	
Chrysene			0.010	
Total Noncarcinogenic PNAs	0.470			
Acenaphthene			0.010	
Anthracene			0.010	
Fluoranthene			0.010	
Fluorene			0.010	
Naphthalene			0.010	
Phenanthrene			0.010	
Pyrene			0.010	

J = Compound is present, but below the PQL.
B = Compound is also found blank.

FIGURE 5
TREATED WATER DISCHARGE REPORT

TANK ID: _____

FILLING COMPLETED: _____ **(Date/Time/Initials)**

SAMPLE COLLECTED: _____ **(Date/Time/Initials)**

SAMPLE RESULTS RECEIVED: _____ **(Date/Time/Initials)**

SAMPLE PASSED DISCHARGE CRITERIA: _____**YES/NO**_____
Circle one

DISCHARGE STARTED: _____ **(Date/Time/Initials)**

DISCHARGE COMPLETED: _____ **(Date/Time/Initials)**

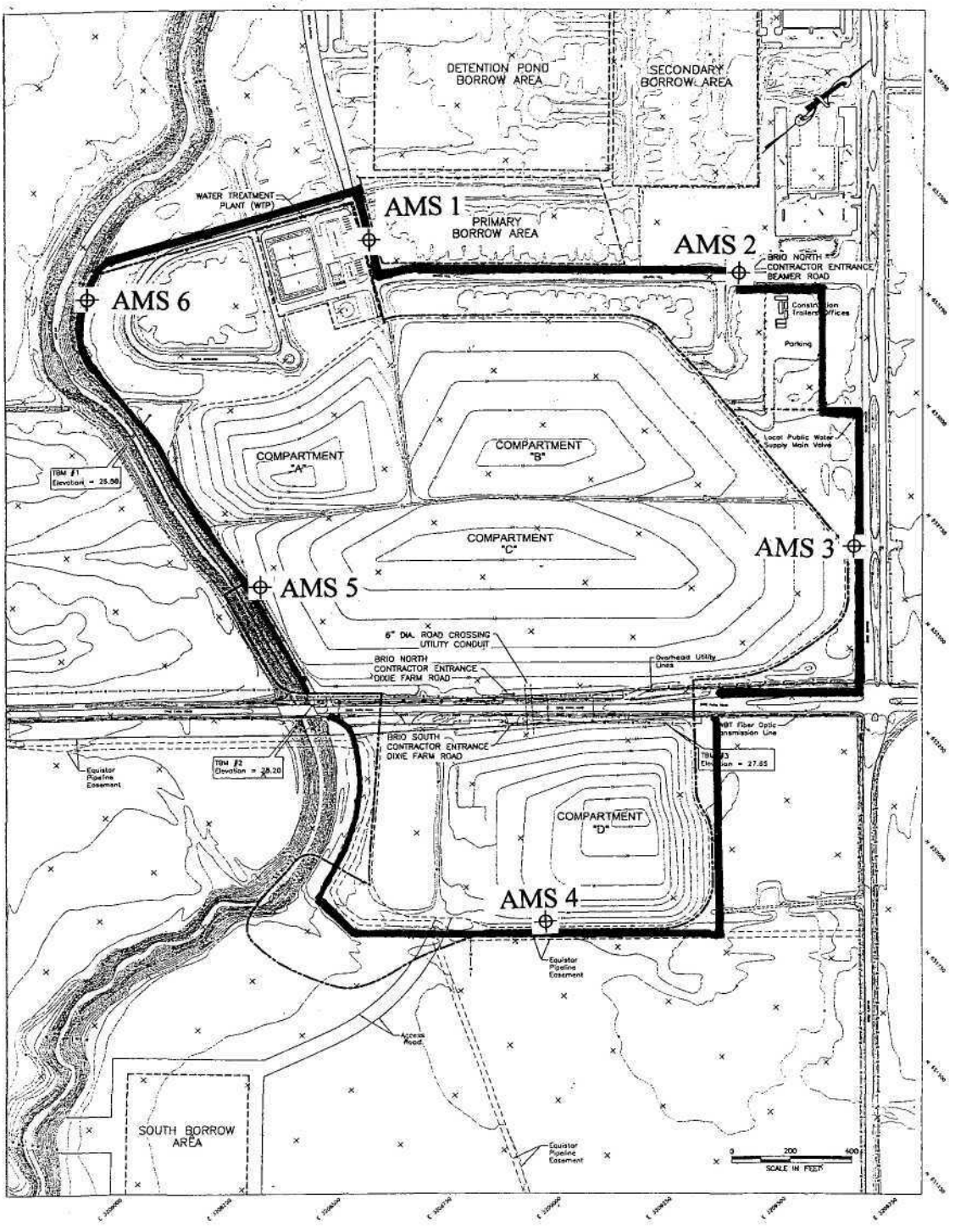
FIELD TESTS – Each day of discharge

Date	Time	pH	D.O. (mg/L)	Temp. (°F)	Initials

DISCHARGE FLOWS

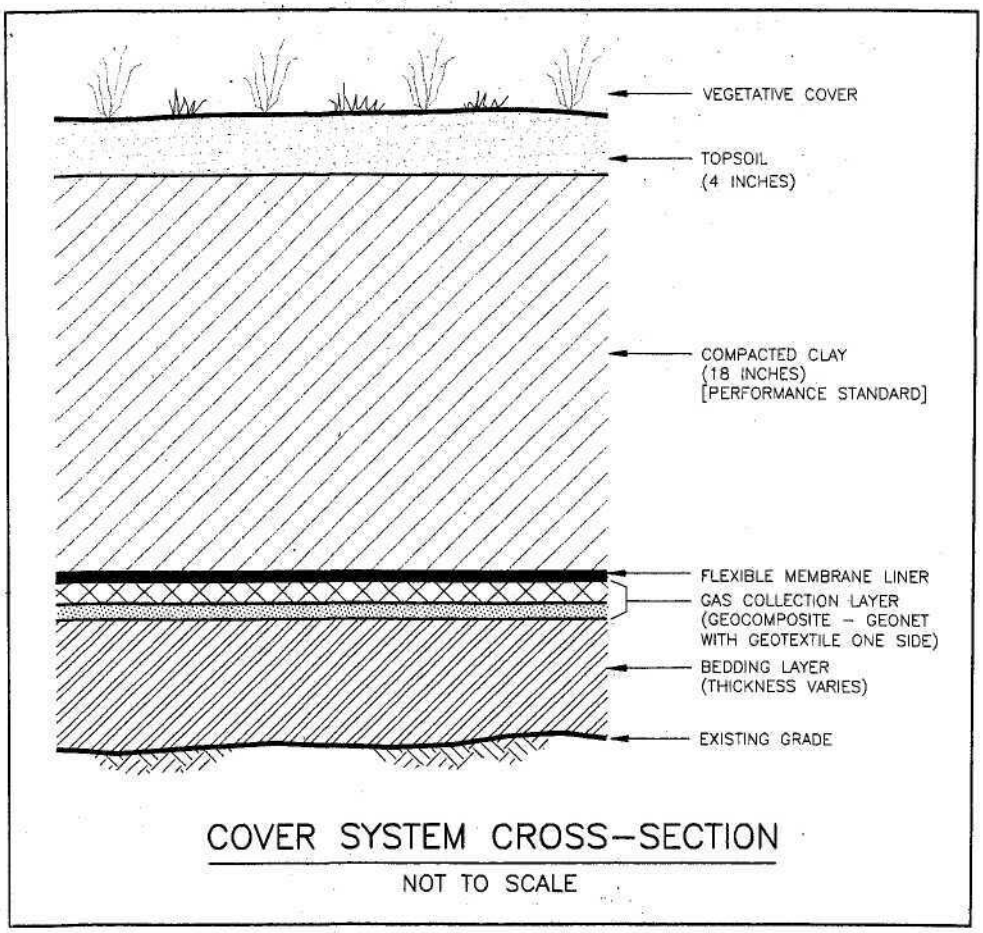
Date	Time	Average Flow (gpm)	Initials

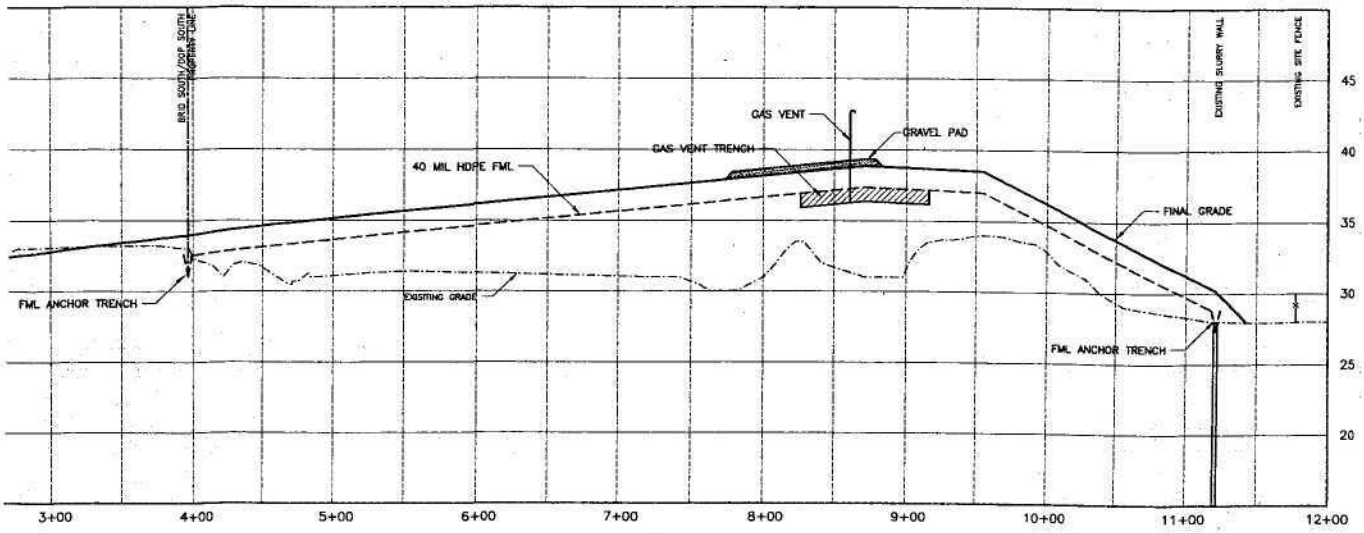
FIGURE 6
SCHEDULED FENCELINE AIR MONITORING SAMPLE LOCATIONS



⊕ Air Monitoring Station

FIGURE 7
COVER SYSTEM DESIGN





TYPICAL FINAL GRADING CROSS SECTION

APPENDIX A

SITE INSPECTION CHECKLIST

BRIO SITE INSPECTION CHECKLIST

Date:

	ITEM INSPECTED	CHECK FOR	CONDITION FOUND	LOCATION	TIME	INITIALS
ACCESS ROADS/GATES/FENCES/SIGNS	Roads	Excessive Erosion Overgrowth				
	Perimeter Fencing and Signs	Deterioration Damage Signs 150 ft.				
	Gates/Locks	Operation Deterioration Damage				
COVER	Surface	Damage by Vehicles Excessive Erosion Settlement Ponding				
	Slopes	Failure Excessive Erosion				
	Vegetation	Distressed Grasses Excessive Woody Plants				
	Drainage Pipes/Swales/ Ditches	Obstructions Excessive Erosion/Trash				
BARRIER WALL	Alignment	Penetrations Surface Damage				

BRIO SITE INSPECTION CHECKLIST

Date:

	ITEM INSPECTED	CHECK FOR	CONDITION FOUND	LOCATION	TIME	INITIALS
EQUIPMENT	Portable Pumps Pump # and Size:	Oil Level Test Run				
	Portable Generators Generator # and Size:	Oil Level Test Run Voltage Check				
	Pressure Washer	Oil Level Hoses Trailer Condition PSV Inspection is Indate Test Run				
	Vehicles	Fluid Levels Hoses & Belts Tire Condition and Pressure Registration Inspection				
	Other:					
	Other:					

APPENDIX B

SITE MAINTENANCE CHECKLIST

BRIO SITE MAINTENANCE CHECKLIST

Date: _____

Facilities to be maintained:

Fences/Gates/Signs/Locks
Onsite Access Roads
Cover/Geosynthetic
Barrier Wall
Groundwater/DNAPL Recovery and Treatment System
Gas Recovery and Collection System
Mud Gully Improvements
Portable Pumps
Pressure Washer
Air Conditioners
Vehicles
Other Facilities

Facility	Reason for Maintenance	Maintenance Performed	Maintenance Completed	Time	Initials

APPENDIX C

SAMPLING AND ANALYSIS PLAN AND QUALITY ASSURANCE/QUALITY CONTROL PLAN

SAMPLING AND ANALYSIS PLAN

QUALITY ASSURANCE/QUALITY CONTROL PLAN

FOR

THE BRIO
SUPERFUND SITE
HARRIS COUNTY, TEXAS

Prepared By The

BRIO SITE TASK FORCE
2501 Dixie Farm Road
Houston, Texas 77089

FEBRUARY 2004

Rev. 0

TABLE OF CONTENTS

TABLES

FIGURES

SAMPLING AND ANALYSIS-QA/QC PLAN

1.0 INTRODUCTION

This plan has been prepared to provide standard operating procedures (SOPs) and quality assurance/quality control (QA/QC) requirements for the Brio Site during the post closure maintenance, operations, and monitoring (MOM) period. Sampling media types at the Brio Site include groundwater, surface water, treated water, and air.

Sections 2.0 through 10.0 present the standard operating procedures (SOPs) for sampling and monitoring of the various media during the MOM period. The SOPs were written specifically for the Brio Site. They are designed to ensure that the samples are collected in such a manner that they are representative of field conditions and that the samples are properly identified, preserved, and transported to maintain sample integrity.

The sampling objectives during the MOM period are:

a) Verify that discharged treated waters meet the discharge criteria listed in Table 1 prior to discharge
b) Monitor the surface water quality in Mud Gully and Clear Creek
c) Monitor groundwater quality in the Fifty-Foot Sand Zone (FFSZ)
d) Monitor air quality routinely in site work areas, per event for potential releases, and semi-annually at the site perimeter
e) Monitor Numerous Sand Channels Zone (NSCZ) groundwater gradient.
f) Conduct sampling and analysis activities in such a manner as to provide defensible results

The QA/QC Plan presented in Section 11.0 covers field sampling and analytical QA/QC. The QA/QC Plan outlines the requirements necessary to accomplish the Brio Site project objectives.

2.0 SOP-001: SAMPLE CONTAINERS AND PRESERVATION

All samples collected for compliance purposes will be stored in containers that are certified clean. The analytical laboratory designated to perform the chemical analyses will often provide pre-cleaned sample containers. The laboratory should specify the type, size, and quantity of sample containers for each parameter to be analyzed.

The designated analytical laboratory will prepare the sample containers with the appropriate chemical preservative for the sample matrix and the analysis requested. Sample containers containing water or soil matrices are to be placed on ice in an insulated cooler upon sample collection. Air samples collected in SUMMA canisters do not require cooling.

Multiple analytical parameters having like preservation requirements may listed on the same sample container as long as the additive minimum volume requirements for all of the parameters are met.

3.0 SOP-002: SAMPLE DOCUMENTATION

All forms and logbooks entries will be printed in black ink. All entries will be initialed and dated. Corrections will be made with a single strike through the error, the correction written next to the strikeout, the person's initials and the date. The use of correction fluid or tape is prohibited.

3.1 FIELD LOGBOOK

All samples will be logged in a bound field logbook. The following information will be entered into the field logbook:

- Sample identification
- Date and time of sample collection
- Sampler's name
- Matrix
- Level PPE
- Weather
- Analytical parameters
- Sample appearance
- Sampling method
- SOP # reference
- Laboratory name
- Additional comments

3.2 SAMPLE LABELS

Sample labels will be completed and attached to each sample container. Clear waterproof tape or sealable plastic bags will be used when necessary for label protection. The following information will be recorded on each sample container label:

- Project name (Brio)
- Sample identification
- Date and time of sample collection
- Preservatives
- The sampler's initials

3.3 CUSTODY SEAL

A custody seal will be completed and attached to each container linking the cap with the container or it may be placed on the outside of the cooler. The sampler will sign the custody seal.

3.3 CHAIN OF CUSTODY

Chain-of-custody forms (COCs) will be completed for all samples collected. The COC forms will contain the following information:

- Project name, address, phone, and project contact name
- Sample identification
- Date and time of sample collection
- Sample matrix
- Preservatives for each sample
- Required analyses
- Signatures of all parties that handle the samples beginning with sample collection and ending at the laboratory receiving department
- Date and time of all sample custody transfers from one party to another

The COC will be signed as "relinquished" and "received" along with the date and time for each transfer of sample custody even if the two parties involved in the transfer work for the same company and work at the same location.

The completed COCs may be placed in a plastic sealable storage bag and attached to the underside of the cooler lid for overnight shipping or given directly to a local courier service or laboratory courier.

4.0 SOP-003: TREATED WATER SAMPLING PROCEDURE

Treated water samples will be collected from on-site storage tanks. The following procedures will be followed for water sampling from the storage tanks to assure that treated water is acceptable for direct discharge based on the discharge criteria as presented in Table 2 of the MOM Plan and Table 1 of this plan.

Typically, tanks will be sampled using a coliwasa sampling device. Eight locations at approximately equal distances around the tank will be composited in the field.

4.1 EQUIPMENT

- Field logbook
- Water proof pens
- Sample bottles
- Coliwasa (or similar device)
- Chain-of-custody forms/custody seals
- Shipping containers
- Non-phosphate soap (Liquinox)
- Deionized water
- Appropriate PPE

4.2 SAMPLING PROCEDURE USING A COLIWASA SAMPLER

4.2.1 Check the coliwasa to verify that it is functioning and has been properly decontaminated. Adjust the locking mechanism, if necessary, so that the stopper provides a tight closure.

4.2.2 Treated water is expected to be free of hazardous materials; however, the sampler should as a minimum wear a hard hat, steel-toe shoes, safety glasses, and latex or nitrile gloves when sampling and handling treated water.

4.2.3 Put the coliwasa in the open position by placing the stopper rod handle in the T position and pushing the rod down until the handle sits against the locking block.

4.2.4 Slowly lower the coliwasa into the water at a rate that permits approximately equal levels of liquid inside and outside the sampler tube. If the level of the liquid inside the sample tube is lower than outside the tube, the sampling rate is too fast and will result in a non-representative sample.

4.2.5 When the coliwasa is at the desired depth (close to the bottom of the tank without touching), push the tube downward against the stopper to close the sampler. Lock the coliwasa in the closed position by turning the handle until it is upright and one end rests tightly on the locking block.

4.2.6 Slowly withdraw the coliwasa from the tank with one hand while wiping the sampler tube with a clean disposable cloth or rag with the other hand.

4.2.7 Carefully discharge the sample into the compositing container by pulling the lower end of the T – handle away from the locking block, while the lower end of the sampler is positioned over the container.

4.2.8 After the last sub-sample is collected, gently swirl the composite container for approximately one minute, drain the sample into individual containers, and seal the containers with Teflon-lined caps.

4.2.9 Attach a completed label, record all data in the field logbook, and complete the chain of custody (COC) form per SOP-002. See Section 4.3-Table 1 for the list of analytical parameters.

4.2.10 Prepare the sample for shipment to the laboratory per SOP-001.

4.2.11 Unscrew the T-handle and disengage the locking block. Clean the coliwasa by rinsing it with a non-phosphorus laboratory grade detergent such as Liquinox followed by several rinses with deionized water.

4.3 ANALYTICAL PARAMETERS

Table 1 presents the analytical parameters that will be listed on the COC.

TABLE 1
TREATED WATER DISCHARGE CRITERIA

PARAMETER	DISCHARGE LIMIT (mg/l)	Holding Time
pH	6.0-9.0 (units)	24 hours
BOD	81	48 hours
COD	568	28 days
Sulfur (Sulfide)	0.6	7 days
Phosphorus	4	28 days
Ammonia as N	23	28 days
Oil and Grease	31	28 days
Phenolics	0.7	28 days
TSS	62	7 days
Copper	0.093	6 months
Volatiles *	*	14 days
Semivolatiles *	*	7 days

*It is not necessary to separately list the individual volatile and semi-volatile compounds on the COC. Brio management should make prior arrangements with the laboratory to analyze treated water samples for the following organic compounds:

VOCs

- 1,1,2-trichloroethane (0.054)
- 1,2-dichloroethane (0.211)
- Vinyl Chloride (0.268)
- Methylene Chloride (0.089)

Semi-volatiles

- Bis(2-chloroethyl)ether (0.757)
- Total Carcinogenic PNAs (0.350)
  - Benzo(a)anthracene
  - Benzo(b)fluoranthene
  - Benzo(k)fluoranthene
  - Benzo(a)pyrene
  - Dibenzo(a,h)anthracene
  - Indeno(1,2,3,c,d)pyrene
- Total Noncarcinogenic PNAs (0.470)
  - Acenapthene
  - Anthracene
  - Chrysene
  - Fluoranthene
  - Fluorene
  - Phenanthrene
  - Pyrene

(discharge limit – mg/l)

4.4 LABORATORY PRELIMINARY AND FINAL REPORTS

Brio management should make prior arrangements with the laboratory to provide a preliminary report to be faxed to the Brio Site within three working days of sample receipt at the laboratory. The preliminary report will contain the following:

- Site name
- Field sample ID
- Laboratory sample ID
- COC copy showing receipt at laboratory

and

For each parameter in Table 1:

- Analytical result with units
- Practical quantitation limit with units
- Discharge limit with units

The laboratory will deliver a final report to the Brio Site approximately 30 days following analysis. The final report will provide data that will allow a third party to validate the report.

5.0 SOP-004: GROUNDWATER SAMPLING PROCEDURE USING PASSIVE DIFFUSION BAG SAMPLERS FOR VOCs

The purpose of this SOP is to provide guidance for the collection of VOCs in groundwater from monitoring wells using a Passive Diffusion Bag Sampler (PDB). Table 2 presents the Maximum Contaminant Level (MCL) and holding time for the Fifty Foot Sand Zone (FFSZ) groundwater volatile list.

Note that PDB samplers can only be used for sampling VOCs. The following procedure may be modified as necessary per the manufacturers' recommendations to accommodate various models of PDBs.

5.1 EQUIPMENT

- Field logbook
- Water proof pens
- Field data sheets
- Water level indicator
- Passive diffusion bag sampler (PDB) with sleeve and designated weights
- Sample bottles (40-ml VOA vials)
- Sample bottles (1L amber)*
- Nylon cord
- Chain-of-custody forms/custody seals
- Deionized water
- Shipping containers
- Stainless steel weights
- Tie wraps
- Plastic sheeting
- Scissors or knife
- Non-phosphate soap (Liquinox)
- Ziplock bags
- Paper towels
- 5-Gallon bucket
- Appropriate PPE
- As-built diagrams of monitoring wells

* Only if semivolatiles are required

5.2 PROCEDURE

5.2.1 As a minimum, utilization of standard OSHA Level D personal protection equipment (PPE) will be required, as prescribed by the site specific Health and Safety Plan. Air monitoring with a hand held organic vapor monitor will conducted in the breathing zone and in well casing during sampling. The results of hand held monitoring will be documented on the field data sheet presented at the end of this procedure.

5.2.2 Use the field data sheet presented in Figure 1 to record sampling information during PDB placement and retrieval. Save the field data sheet for inclusion in the sampling report.

5.2.3 Each PDB sampler will have a stainless-steel weight and may have an individual decontaminated sleeve. Prior to the sampling event, decontaminate the dedicated stainless-steel weight with a Liquinox solution and rinsed with distilled water. After rinsing, dry the weights with clean paper towels and place in a plastic bag, sealing to minimize that no outside contaminants are introduced prior to use during subsequent

sampling activities.

5.2.4 Using a clean water level probe, measure the static water level and well depth. Compare the measured well depth with the reported well depth to the bottom of the well screen from the well construction records.

5.2.5 Attach the clean stainless-steel weight to the end of the line.

5.2.6 Calculate the distance from the bottom of the well, or top of the sediment in the well, up to the point where the PDB sampler is to be placed. The PDB should be placed near the center of the well screen.

5.2.7 Immediately prior to placing the weighted PDB sampler into the well rinse the PDB sampler with distilled water. The PDB sampler should be attached to the nylon line. PDB samplers can be attached using the following procedure:

a) Insert plastic cable through the knots/loop in the weighted line.
b) The designated holes punched at the ends of the bag can be used to attach the PDB sampler to the weighted line. Stainless steel spring clips or cable ties.

5.2.8 Carefully lower the PDB sampler down the well until the sampler is positioned near the mid-point of the well screen.

5.2.9 Secure the assembly in this position. A suggested method is to attach the weighted line to a hook on the inside of the well cap. Reattach the well cap.

5.2.10 Allow the PDB sampler to remain undisturbed for a period of at least two weeks as it equilibrates.

5.2.11 Remove the PDB sampler from the well by using the attached line. The PDB sampler should not be exposed to heat or agitated.

5.2.12 Examine the surface of the PDB sampler for evidence of algae, iron or other coatings, and for tears in the membrane. Record any unusual observations.

5.2.13 Detach and remove the PDB sampler from the weighted line. The nylon rope and weight may be reused in the same well if they are in good condition, otherwise, dispose of them according to Brio Site procedures.

5.2.14 Transfer the PDB sampler to the designated sampling area away from the well head. Using decontaminated scissors or other cutting devices, cut the corner of the PDB sampler and pour the water directly into three 40-ml VOA vials in a manner that minimizes water agitation.

5.2.15 Cap each vial with a Teflon lined septum making sure that there are no bubbles in the vial.

5.2.16 Complete the sample labels and COC per SOP-002. List "Drinking Water Volatiles" (and Semivolatiles if required) for the analytical parameters. Table 2 presents the Drinking water analyte list and Maximum Contaminant Levels (MCLs).

5.2.17 Place the sample containers in a cooler with the COC containing wet ice immediately after collection and document the sample event in the Field Logbook per SOP-002.

TABLE 2
FFSZ GROUNDWATER DRINKING WATER LIST AND MAXIMUM CONTAMINANT LEVELS (MCL)

DRINKING WATER VOLATILE LIST [1]	MCL (µg/ l)
Benzene	5
Carbon Tetrachloride	5
Chlorobenzene	100
1, 2-Dichlorobenzene (o-dichlorobenzene)	600
1, 4-Dichlorobenzene (p-dichlorobenzene)	75
1, 2-Dichloroethane	5
1, 1-Dichloroethene	7
cis-1, 2-Dichloroethene	70
trans-1, 2-Dichloroethene	100
Methylene Chloride (Dichloromethane)	5
1, 2-Dichloropropane	5
Ethylbenzene	700
Styrene	100
Tetrachloroethene	5
Toluene	1000
1, 2, 4-Trichlorobenzene	70
1, 1, 1-Trichloroethane	200
1, 1, 2-Trichloroethane	5
Trichloroethene	5
Vinyl Chloride	2
Xylenes (Total)	10000
Total trihalomethanes (TTHMs) [2]	100

1 The holding time for volatiles is 14 days
2 Total trihalomethanes = Chloroform, Bromodichloromethane, Bromoform, and Dibromochloromethane

FIGURE 1

ANNUAL GROUNDWATER SAMPLING
PASSIVE DIFFUSION BAG METHOD
BRIO SUPERFUND SITE
HOUSTON, TEXAS

Well ID:

PDB DEPLOYMENT

Date	Time	PID/FID Reading		Depth to Water (ft-toc)	Well TD (ft-toc)	Casing Dia (in)	Air Temp (°F)	Weather Conditions
		Well Casing	Breathing Zone					

Sampler Initials:
Notes:

Top of PDB Depth (ft-toc):
PDB Length (in.):

PDB RETRIEVAL

Date	Time	PID/FID Reading		Depth to Water (ft-toc)	Well TD (ft-toc)	Casing Dia (in)	Air Temp (°F)	Weather Conditions
		Well Casing	Breathing Zone					

Sampler Initials:
Notes:

6.0 SOP-005: GROUNDWATER SAMPLING PROCEDURE USING LOW-FLOW-PURGE (MICRO-PURGE)

Micro purging is an approach to purging a well based on the observation that groundwater flows through the well screen in most formations with sufficient velocity to maintain an exchange with the formation water surrounding the well screen. By placing a pump within the screen interval and pumping at a low flow rate that does not induce drawdown of the water column, a representative sample of formation groundwater can be collected with minimal withdrawal of stagnant water. Ideally micro purging should be conducted in wells in which dedicated pumps have been installed. It is possible to use non-dedicated pumps if a sufficient amount of time is allowed for the water level to equilibrate following insertion of the pump.

Alternately, a peristaltic pump on the surface can be used for shallow wells by placing the opening of the inlet tubing within the screen interval. When using this approach, use disposable tubing to avoid cross contamination from well to well.

Table 3 presents the Maximum Contaminant Level (MCL) and holding times for the Fifty Foot Sand Zone (FFSZ) groundwater.

6.1 EQUIPMENT

- Field logbook
- As-built diagrams of monitoring wells
- Field data sheets
- Plastic sheeting
- Generator if using pump
- Gasoline for generator
- Air compressor for bladder pumps
- Pump (submersible or peristaltic)
- Stop watch
- Appropriate pump fittings (e.g., hose clamps, barbed fittings, etc.)
- Tubing for pump
- Control box (if necessary)
- Water level indicator
- Drums
- Marking pen for labeling drums
- Wrench for opening/sealing drums
- Appropriate PPE
- 1L Graduated cylinder
- Non-phosphate detergent (Liquinox)
- Sample bottles
- Distilled water

6.2 PROCEDURE

6.2.1 As a minimum, utilization of standard OSHA Level D personal protection equipment (PPE) will be required, as prescribed by the site specific Health and Safety Plan. Air monitoring with a hand held organic vapor monitor will conducted in the breathing zone and in well casing during sampling. The results of hand held monitoring will be documented on the field data sheet presented in Figure 2.

6.2.2 All non-dedicated equipment shall be decontaminated in with a Liquinox solution and rinsed with distilled water.

6.2.3 Using a clean water level probe, measure the static water level and record on the field data sheet (see the field data sheet at the end of this procedure).

6.2.4 Assemble the pump, hoses and safety cable. If using a non-dedicated submersible pump or a peristaltic pump, slowly lower the submersible pump or weighted peristaltic pump tubing into the well. The submersible pump or peristaltic pump tubing intake should be set at or just above the middle of the screened interval if the aquifer is under confined conditions (depth to water is above screen), or just below the air/water interface if the aquifer is under unconfined conditions (screened across the water table). Record the intake depth on the field data sheet.

6.2.5 If using a non-dedicated submersible pump or a peristaltic pump, allow sufficient time for the water level to equilibrate to obtain a representative sample.

6.2.6 Make connections between the pump and control box if using an air-lift or bladder pump (i.e., Well Wizard).

6.2.7 Use a ground fault interrupter (GFCI) between the generator and electrical devices.

6.2.8 Begin micro-purging the well. A well should be purged at or below its recovery rate, ideally less than 0.2 to 0.3 L/min.

6.2.9 Monitor the drawdown in the well using the water level meter and record the data on the field data sheet. If the drawdown exceeds 0.3 ft, then reduce the pumping rate to insure that drawdown does not exceed 0.3 ft.

6.2.10 Calibrate and connect the water quality meters to the discharge hose and measure the field parameters. Record the measurements on the field data sheet.

6.2.11 Repeat the field parameter measurements at a regular interval (i.e., every minute). Record the values in the field data sheet. Continue purging until the measured parameters stabilize for three successive readings.

6.2.12 If field parameters have not stabilized after three successive readings, continue taking measurements at three-minute intervals up to a maximum of five successive readings. If after five successive readings the parameters have not stabilized, an entry shall be made in the field data sheet indicating that sampling will be conducted without stabilized parameters.

6.2.13 For volatile analysis, collect samples in three 40-ml VOA vials in a manner that minimizes water agitation. If semi-volatile analysis is necessary, collect samples in 1L amber glass bottles.

6.2.14 Cap each VOA vial with a Teflon lined septum making sure that there are no bubbles in the vial. Cap 1L bottles with Teflon lined lids.

6.2.15 Complete the sample labels and COC per SOP-002. List "Drinking Water Volatiles" (and Semivolatiles if required) for the analytical parameters. Table 2 (Section 5.0) presents the Drinking water analyte list and Maximum Contaminant Levels (MCLs).

6.2.16 Place the sample containers in a cooler with the COC containing wet ice immediately after collection.

6.2.17 Document the sample event in the Field Logbook per SOP-002.

6.2.18 Purge water should be containerized and transferred to the onsite water treatment plant for processing.

6.3 CAUTIONS AND INTERFERENCES

The primary goal in performing groundwater sampling is to obtain a representative sample of the groundwater body. Analysis can be compromised be field personnel in two primary ways: (1) taking an unrepresentative sample or (2) by incorrect handling of the sample. There are numerous ways of introducing foreign contaminants into a sample, and these must be avoided by following strict sampling procedures and utilizing trained field personnel.

In a non-pumping well, there will be little or no vertical mixing of the water, and stratification will occur. The well water in the screened section will mix with the groundwater due to normal flow patterns, but the well water above the screened section will remain isolated, become stagnant, and may lack the contaminants present in the groundwater. Persons sampling should realize that stagnant water may contain foreign material inadvertently or deliberately introduced from the surface resulting in an unrepresentative sample. To safeguard against collecting non-representative stagnant water, the following guidelines and techniques should be adhered to during sampling:

- Slowly lower sampling devices through the water column.
- To avoid resuspension of settled solids, total well depth and sediment thickness measurements should be taken after sampling is completed.

- For wells that can be easily pumped or bailed to dryness, micro purging and low-flow sampling methods shall be considered.

  Stainless steel, Teflon, and glass are the preferred materials of construction for samplers and evacuation equipment (bladders, pumps, tubing, etc.). The use of plastics such as PVC or polyethylene should be avoided if possible when analyzing for organics.

FIGURE 2
MICRO-PURGE FIELD DATA SHEET

Date: _____ **Well ID:** _____ **Location:** _____ **Sampler:** _____

Time	OVM Well Casing	OVM Breath. Zone	Depth to Water (ft-toc)	Well TD (ft-toc)	Casing Dia. (in.)	Intake Depth (ft-toc)	Dis. O_2 (ppm)	Redox Potential (mv)	pH	Conduc. (µmho/cm)	Temp. °F °C	Comments

Sample Time: _____

7.0 SOP-006: SURFACE WATER SAMPLING PROCEDURE

The purpose of this SOP is to provide guidance for the collection of surface water samples. Surface water will be collected at the sample points and frequency specified in Section 8.0 of the Brio Site Maintenance, Operations, and Monitoring Plan, and tested for TCL volatiles.

7.1 EQUIPMENT

- Field logbook
- Water proof pens
- Sample bottles
- Shipping containers
- Appropriate PPE
- Chain-of-custody forms/custody seals

7.2 PROCEDURE

7.2.1 When possible, collect samples in a downstream to upstream direction.

7.2.2 Using adequate protective clothing, access the sample point by safe and appropriate means.

7.2.3 If it is necessary to stand in the stream, the sample must be collected upstream of the sampler.

7.2.4 Place an opened 40-ml VOA vial under the surface of the stream and allow the vial to fill while pointing the mouth of the vial upstream.

7.2.5 To minimize the dilution of the preservative in pre-preserved vials, take care to remove the vial from the stream as soon as the vial is full.

7.2.6 Cap the vial with a Teflon lined septum making sure that there are no bubbles in the vial.

7.2.7 Complete the sample labels and COC per SOP-002. List "TCL Volatiles" for the analytical parameters. Table 3 presents the Surface Water Performance Standards and Quality Goals.

7.2.8 Place the sample containers in a cooler with the COC containing wet ice immediately after collection.

7.2.9 Document the sample event in the Field Logbook per SOP-002.

TABLE 3
SURFACE WATER

	SURFACE WATER PERFORMANCE STANDARDS		BSTF SURFACE WATER QUALITY GOALS [2]	
Compound [1]	Mud Gully (µg/ l)	Clear Creek (µg/ l)	Mud Gully (µg/ l)	Clear Creek (µg/ l)
1, 1, 2-Trichloroethane	4,180	41.8	3020	302
1, 2-Dichloroethane	20,000	1,794	739	73.9
1, 1-Dichloroethene	8,740	87.4	58.4	5.84
Vinyl Chloride	9,450	94.5	4150	415

1 The holding time for volatiles is 14 days
2 These levels are based on the Texas Commission on Environmental Quality (TCEQ) surface water quality standards as adopted in August 2002, and based on calculations presented in the Texas Total Maximum Daily Load (TMDL) Program

8.0 SOP-007: ROUTINE AND EVENT BASED AIR MONITORING PROCEDURE

8.1 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide a procedure for routine air monitoring of onsite work areas and event-base fence line air monitoring.

8.2 SUMMARY

The following sequence is a summary of actions that will occur to implement this procedure:

Hand held organic vapor analyzers (OVA) and particulate monitors will be used to monitor events that require Worker Health and Safety Plan (WHASP) location specific air monitoring. WHASP procedures are summarized in this procedure.

If there is an event, mitigate the release, take OVA readings, and notify BSTF management (or others as designated by the BSTF management). If there are noticeable odors and OVA levels are below action levels, notify management.

If the readings are above action levels, and the BSTF management authorizes fence line monitoring, then procedures provided herein will be followed. In general, the procedure calls for a SUMMA canister to be deployed downwind at the fence line. The SUMMA canister will collect air for a 24-hour period. The SUMMA canister will be sent to a laboratory for testing. The event and test results will be provided to the USEPA.

8.3 ROUTINE AIR MONITORING

8.3.1 Organic Monitoring

Air quality monitoring will be conducted at active site areas including, but not limited to, roadways, decontamination areas, site construction areas, or release areas (known or suspected spills, leaking pipes or vessels, or odors), and other areas where work activities may present a potential for particulate or volatile emissions. Measurements above background levels for organic vapors or dust will be reported to BSTF management. Air monitoring results will be maintained onsite.

8.3.1.1 Instrumentation – Organic vapor levels will be monitored using an OVA at the beginning of and during active work (i.e., potential exposure to, or release of affected material).

8.3.1.2 Locations – Organic vapor levels will be monitored in the work area, at work area access points, and at the down wind fence line relative to the potential event. The locations will be documented in such a manner that the information can be related to the operations and events in progress. See Figure 3 for the Daily Air Monitoring Report form.

8.3.1.3 Action Levels – Table 4 presents the action levels for various locations onsite.

TABLE 4
VOLATILE EMISSION RESPONSE

Location	Action Level	Response [4]
Immediate Work or Release Area	5 muab[1] above background for 15 seconds[2]	Mitigate release and notify BSTF management
Immediate Work or Release Area	1 muab above background for 1 minute[2]	Mitigate release and notify BSTF management
Fence Line	1 muab above background for 5 minutes[3]	Mitigate release and notify BSTF management

1 muab = measurement unit above background.
2 WHASP Section 4.1.3.
3 AQMS Performance Criteria Table 5 and the Spill/Volatile Emission Release Contingency Plan and Emergency Notification Plan (SVERCP/ENP) Section 4.2.3.
4 Mitigation per WHASP and SVRCP/ENP procedures.

8.3.1.4 Calibration Documentation – Documentation of the pre- and post-use calibration of the unit (according to the manufacturer's directions) will be maintained onsite. See Figure 4 for the Calibration and Maintenance Log.

8.3.2 Particulate Monitoring

Dust levels will be monitored at the beginning of and during site work that is likely to cause dusty conditions. Depending upon soil conditions and previous monitoring results, the sampling frequency will be evaluated and modified by the Safety and Operations Supervisor (SOS).

8.3.2.1 Instrumentation – Dust levels will be monitored using direct reading instrumentation.

8.3.2.2 Locations – Locations will be documented in such a manner that the information can be related to the operations in progress. See Figure 3 for the Daily Air Monitoring Report form.

8.3.2.3 Action Levels – Table 5 lists the dust emission action level and response.

TABLE 5
DUST EMISSION RESPONSE

Action Level	Response
5 mg/m^3 sustained for 60 seconds [1]	Mitigate release [2]

1 ½ the ACGIH TLV of 10 mg/m^3 – WHASP Section 4.2.1
2 Corrective action will be at the direction of BSTF management SOS, or QA Officer.

8.3.2.4 Calibration Documentation – Documentation of the pre- and post-use calibration of the dust monitoring unit (according to the manufacturer's directions) and a record of the daily zeroing will be maintained onsite. See Figure 4 for the calibration form.

8.4 EVENT-BASED 24-HOUR FLAAQS SAMPLING AT FENCELINE (SUMMA CANISTER SAMPLING)

8.4.1 Equipment

The following equipment will be maintained onsite. Portable equipment will be maintained in the water treatment control room.

- Windsock or meteorological station with wind speed and wind direction sensors.
- SUMMA canister – six-liter (6L) – cleaned and evacuated by a laboratory according to the EPA TO-14 method. The storage pressure should be 30" Hg, but no less than 25" Hg.
- Flow controller – cleaned by a laboratory according to EPA TO-14 method. The controller shall be set by the laboratory to provide a 24-hour continuous sample based on a five-liter (5L) sample. This will cause the canister to collect approximately five-liters (5L) of sample without allowing the sample flow to drop too low or allowing the canister to reach ambient pressure. The controller shall have a frit filter on the inlet to remove particulates form the sample stream.
- Pressure gauge – range of 0 to 30" Hg.
- Stainless sample inlet (1/4") – 180° bend at the entrance will point toward the ground. A ¼" nut at the opening will prevent rain from entering the inlet.
- Wrenches for connecting and disconnecting fittings.

8.4.2 SUMMA Canister Deployment

8.4.2.1 BSTF management shall be notified when onsite personnel recognize events that involve noticeable air emissions or OVA readings that exceed Table 4 action levels. BSTF management will decide whether or not to deploy sample collection equipment.

8.4.2.2 If BSTF management decides that sample collection is necessary, observe the windsock or wind direction indicator, and select a downwind location at the fence line from the event (see Figure 5- page 2 for the Brio Site Fence Line drawing). If there is no wind, BSTF management will select the sampling location.

8.4.2.3 Transport the SUMMA canister, flow controller, pressure gauge, and sample inlet to the sample location.

8.4.2.4 Remove the protective cap from the valve inlet and connect the flow controller, pressure gauge, and sample inlet to the SUMMA canister valve. The fittings should be very snug, but do not over tighten.

8.4.2.5 Open the canister valve fully to begin sampling.

8.4.2.6 Record the date, time, location, and description of the event on the Event Based Air Monitoring Sample Form.

8.4.2.7 Record the wind direction on the sample form drawing with an arrow pointing downwind (the direction that the wind is blowing toward). Label the arrow "START".

8.2.4.8 Initial the sample form and record the sample start date, time. Record the sample location on the sample form drawing.

8.4.2.9 Record the canister ID, flow regulator ID, and beginning canister pressure on the sample form. Record the sample ID on the sample form. The sample ID will be in the form of "AIR MM/DD/YY" using the sample start date.

8.4.2.10 The sample collection shall end after 24-hours have elapsed from the beginning of sampling; however, do not allow the canister pressure to reach ambient pressure (keep gauge reading above 0" Hg).

8.4.2.11 Close the canister valve (do not over tighten) and replace the protective cap on the valve inlet.

8.4.2.12 At the end of sample collection, initial the sample form and record the sample end date and time on the form.

8.4.2.13 Record the ending canister pressure on the sample form.

8.4.2.14 Record the ending windsock direction on the sample form drawing with an arrow pointing downwind (the direction that the wind is blowing toward). Label the arrow "END". If available, attach a copy of wind direction data from an on-site meteorological station.

8.4.2.15 Disconnect the flow controller, pressure gauge, and sample inlet from the canister.

8.4.2.16 Fill out a sample label and COC per SOP-002. Table 6 presents the analytes of interest. The sample label will be a tag attached to the canister.

8.4.2.17 Document the sample event in the Field Logbook per SOP-002.

8.4.2.18 Notify the laboratory that the sample is ready for pickup. Send the flow controller, pressure gauge, and stainless sample inlet to the laboratory for cleaning.

8.5 US EPA REPORTING

The US EPA will be notified of events requiring SUMMA canister fence line monitoring.

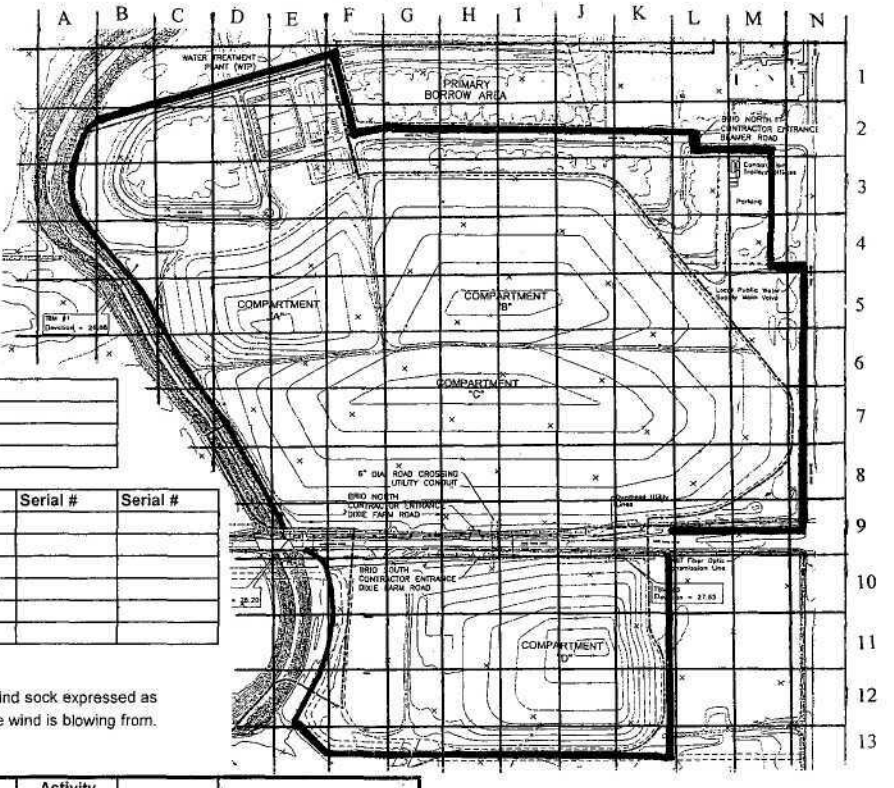
Event based fence line air monitoring results will be reported to the USEPA following receipt and validation of laboratory data and will be summarized in the Annual Effectiveness Report. The report will compare the laboratory results to the Brio Site Fence Line Ambient Air Quality Standards (FLAAQS). Table 6 lists the FLAAQS compounds and standards.

TABLE 6
BRIO SITE FLAAQS

FLAAQS COMPOUND *	STANDARD CONCENTRATION (ppb)
Vinyl Chloride	690
Methylene Chloride	1100
1,2-Dichloroethane	200
Benzene	50
1,1,2-Trichloroethane	656

* The holding time for TO-14 analysis is 14 days

FIGURE 3
BRIO SUPERFUND SITE DAILY AIR MONITORING REPORT



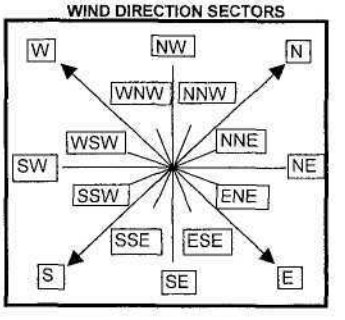
Site Safety Officer:	
Other:	
Date (MM/DD/YY):	
Day of Week:	

Instr Used	Serial #	Serial #	Serial #	Serial #
(A) OVA				
(B) Microtip				
(C) Det Tube				
(D) O_2/Exp				
(E) Dust/Part				
(F) Other				

Notes: o Wind speed is estimated.
o Wind direction is based on wind sock expressed as the sector in the direction the wind is blowing from.

Time	Wind Speed (mph)	Wind Dir (sector)	Activity Location (Grid #)	PPE Level	Readings Comments

WIND DIRECTION SECTORS



Instrument Calibration Check			
Initial Calibration		Final Calibration	
Date:	Initials:	Date:	Initials:

WEATHER CONDITIONS		
Temp °F:	Rain (in.):	Sky Condition:

FIGURE 4
CALIBRATION AND MAINTENANCE LOG

TYPE _____ CONTRACT/PROJECT #: _____

S/N _____

DATE	TIME	CALIBRATION TARGET VALUE	CALIBRATION ACTUAL VALUE	MAINTENANCE	INITIALS

FIGURE 5
EVENT BASED AIR MONITORING SAMPLE FORM

EVENT:

Date: _____

Time: _____

Description: _____

_____

_____

_____

_____

_____

See page 2 for location of event

SAMPLE START:

Date: _____ Initials: _____

Time: _____ Canister SN: _____

Sample ID: _____ Flow Regulator SN: _____

Start Pressure: _____ ("Hg)

See page 2 for start wind direction

SAMPLE END:

Date: _____ Initials: _____

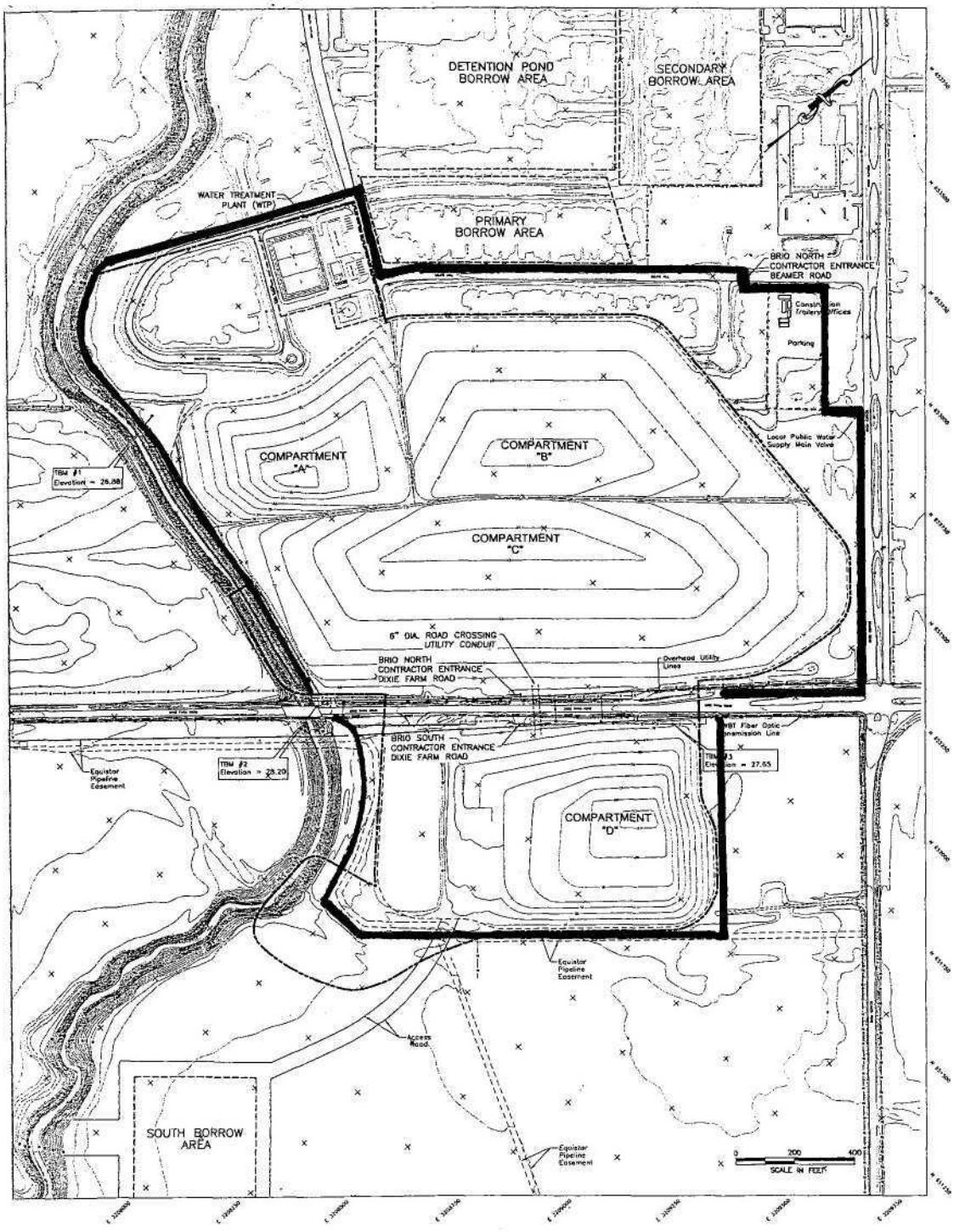
Time: _____

End Pressure: _____ ("Hg)

See page 2 for end wind direction

Comments:

FIGURE 5 (continued)
EVENT BASED AIR MONITORING SAMPLE FORM



002116

9.0 SOP-008: SCHEDULED FENCE LINE AIR MONITORING PROCEDURE

9.1 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide a procedure for scheduled fence line air monitoring at the Brio Site.

9.2 SUMMARY

Scheduled fence line air monitoring consists of concurrently collecting six 24-hour samples at the site perimeter. Figure 6 shows the locations of the air monitoring sample points. After the sample period is complete, the canisters will be sent to a laboratory to be analyzed for site constituents. Results will be compared to FLAAQS shown in Table 6 in Section 8. The sampling frequency is annual.

9.3 EQUIPMENT

The following equipment will be utilized for scheduled fence line air monitoring:

- Windsock or meteorological station with wind speed and wind direction sensors.
- SUMMA canister – six-liter (6L) – cleaned and evacuated by a laboratory according to the EPA TO-14 method. The storage pressure should be 30" Hg, but no less than 25" Hg.
- Flow controller – cleaned by a laboratory according to EPA TO-14 method. The controller shall be set by the laboratory to provide a 24-hour continuous sample based on a five-liter (5L) sample. This will cause the canister to collect approximately five-liters (5L) of sample without allowing the sample flow to drop too low or allowing the canister to reach ambient pressure. The controller shall have a frit filter on the inlet to remove particulates form the sample stream.
- Pressure gauge – range of 0 to 30" Hg.
- Stainless sample inlet (1/4") - 180° bend at the entrance will point toward the ground. A 1/4" nut at the opening will prevent rain from entering the inlet.
- Wrenches for connecting and disconnecting fittings.

9.4 SUMMA CANISTER DEPLOYMENT

9.4.1 Transport the SUMMA canister, flow controller, pressure gauge, and sample inlet to the sample locations located in Figure 6.

9.4.2 Remove the protective cap from the valve inlet and connect the flow controller, pressure gauge, and sample inlet to the SUMMA canister valve. The fittings should be very snug, but do not over tighten.

9.4.3 Open the canister valve fully to begin sampling.

9.4.4 Record the date, time, and location on the Scheduled Fence Line Air Monitoring Sample Form presented in Figure 7.

9.4.5 Record the windsock direction on the sample form drawing with an arrow pointing downwind (the direction that the wind is blowing toward). Label the arrow "START".

9.4.6 Record the canister ID, flow regulator ID, and beginning canister pressure on the sample form. Record the sample ID on the sample form.

9.4.7 The sample collection shall end after 24-hours have elapsed from the beginning of sampling; however, do not allow the canister pressure to reach ambient pressure (keep gauge reading above 0" Hg).

9.4.8 Close the canister valve (do not over tighten) and replace the protective cap on the valve inlet.

9.4.9 At the end of sample collection, initial the sample form and record the sample end date and time on the form.

9.4.10 Record the ending canister pressure on the sample form.

9.4.11 Record the ending windsock direction on the sample form drawing with an arrow pointing downwind (the direction that the wind is blowing toward). Label the arrow "END". If available, attach a copy of wind direction data from an on-site meteorological station.

9.4.12 Disconnect the flow controller, pressure gauge, and sample inlet from the canister.

9.4.13 Fill out a sample label and COC per SOP-002. Table 6 in Section 8 presents the analytes of interest. The sample label will be a tag attached to the canister.

9.4.14 Document the sample event in the Field Logbook per SOP-002.

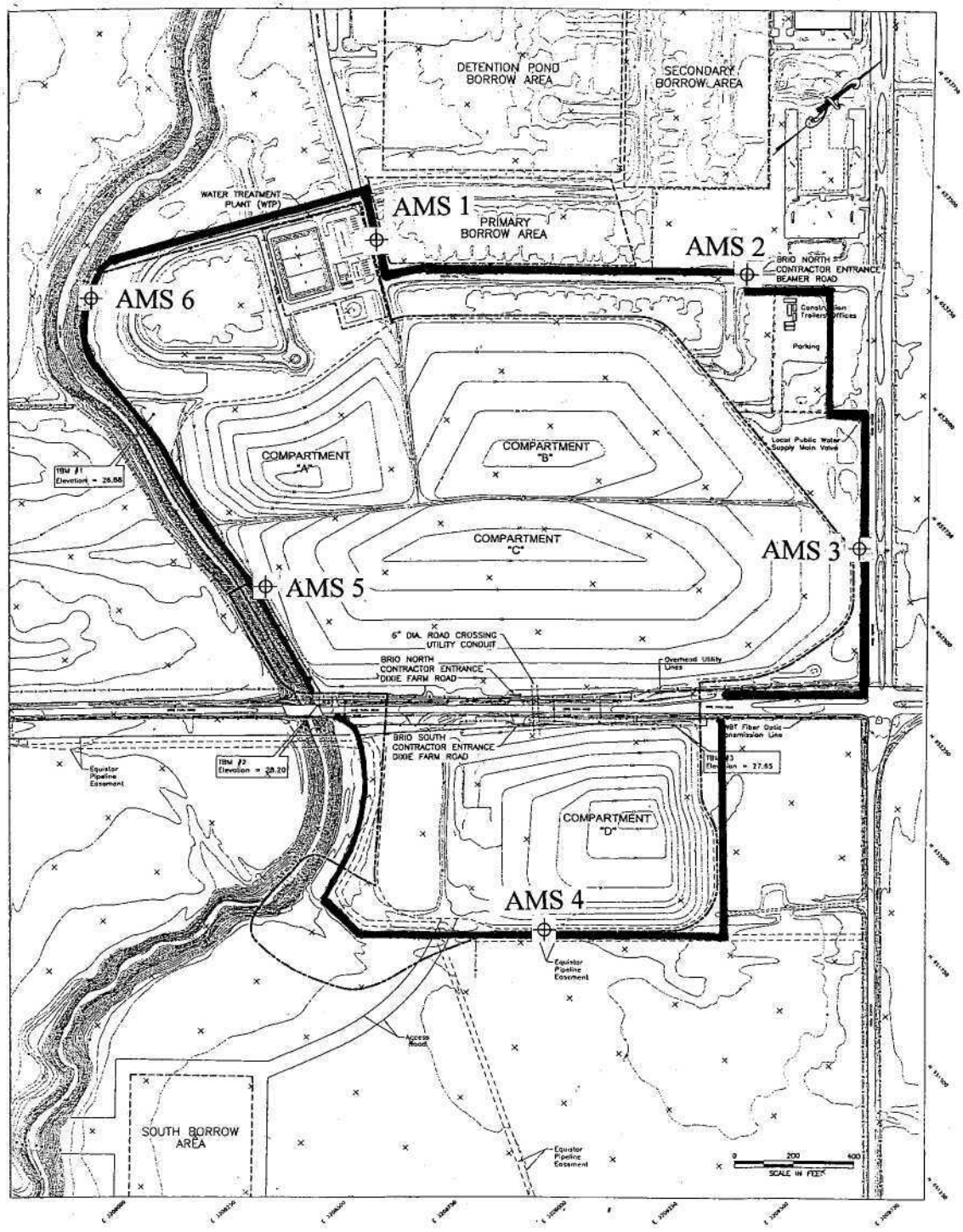
9.4.15 Notify the laboratory that the sample is ready for pickup. Send the flow controller, pressure gauge, and stainless sample inlet to the laboratory for cleaning.

9.5 US EPA REPORTING

The USEPA will be notified if any of the scheduled fence line air monitoring results exceed the FLAAQS (Table 6, Section 8) as soon as the laboratory reports are validated. These results also appear in the Annual Effectiveness Report to the USEPA. If the FLAAQS are not exceeded for a given sampling event, then the

results will only included in the Annual Effectiveness Report to the USEPA.

FIGURE 6
SCHEDULED FENCELINE AIR MONITORING SAMPLE LOCATIONS



⊕ Air Monitoring Station

002120

FIGURE 7
SCHEDULED FENCELINE AIR MONITORING SAMPLING FORM
(See attached for full-size form)

Sample Location	AM-1	AM-2	AM-3	AM-4	AM-5	AM-6
Start Date						
Start Time						
Start Pressure ("Hg)						
Canister ID						
Flow Controller ID						
Start WD (sect)						
Start Initials						
End Date						
End Time						
End Pressure ("Hg)						
Canister ID						
Flow Controller ID						
End WD (sect)						
End Initials						
Comments						

10.0 SOP-009: NSCZ GROUNDWATER GRADIENT CONTROL MONITORING PROCEDURE

The purpose of this SOP is to provide guidance for monitoring groundwater level elevations in the NSCZ. Piezometers have been installed in arrays to provide a means to measure groundwater levels.

In order to provide meaningful measurements, all piezometers within a given array will be measured within a short period of time before piezometers in other arrays are measured.

Each array will be measured as a minimum on a monthly basis.

10.1 EQUIPMENT

- Water level probe
- Organic vapor monitor
- NSCZ Plume Management form
- Non-phosphate soap (Liquinox)
- Rinse water
- Paper towels

10.2 PROCEDURE

10.2.1 As a minimum, utilization of standard OSHA Level D personal protection equipment (PPE) and nitrile gloves will be required, as prescribed by the site specific Health and Safety Plan. Air monitoring with a hand held organic vapor monitor will conducted in the breathing zone and in well casing during sampling. The results of hand held monitoring will be documented on the Daily Site Air Monitoring Report presented in Section 8.0.

10.2.2 Figure 8 presents the location of the piezometers.

10.2.3 The NSCZ Plume Management form presented in Figure 9 will be used to record the groundwater level data.

10.2.4 The water level probe used to measure NSCZ groundwater elevations will be dedicated for that use. DO NOT use the NSCZ probe to measure water levels in the FFSZ wells.

10.2.5 Using the water level probe, measure the water level from the top of case in each piezometer within a given array. Measure all piezometers within an array before moving on to the next array.

10.2.6 Record the groundwater levels on the NSCZ Plume Management form. Initial and date the reading.

10.5.7 Subtract the water level from the top of case elevation listed on the NSCZ Plume Management form and record the result under the "GW ELEVATION" column.

In order to reduce the amount of affected groundwater on the probe, avoid lowering the probe lower than necessary to achieve a reading. Clean the water level probe with non-phosphate soap, rinse with water, and wipe dry with a paper towel.

10.2.9 Any modifications to a piezometer that causes the top of case elevation to change will be reason to re-survey the top of case elevation and update the NSCZ Plume Management form with the new elevation.

FIGURE 8
NSCZ GROUNDWATER PIEZOMETER LOCATIONS

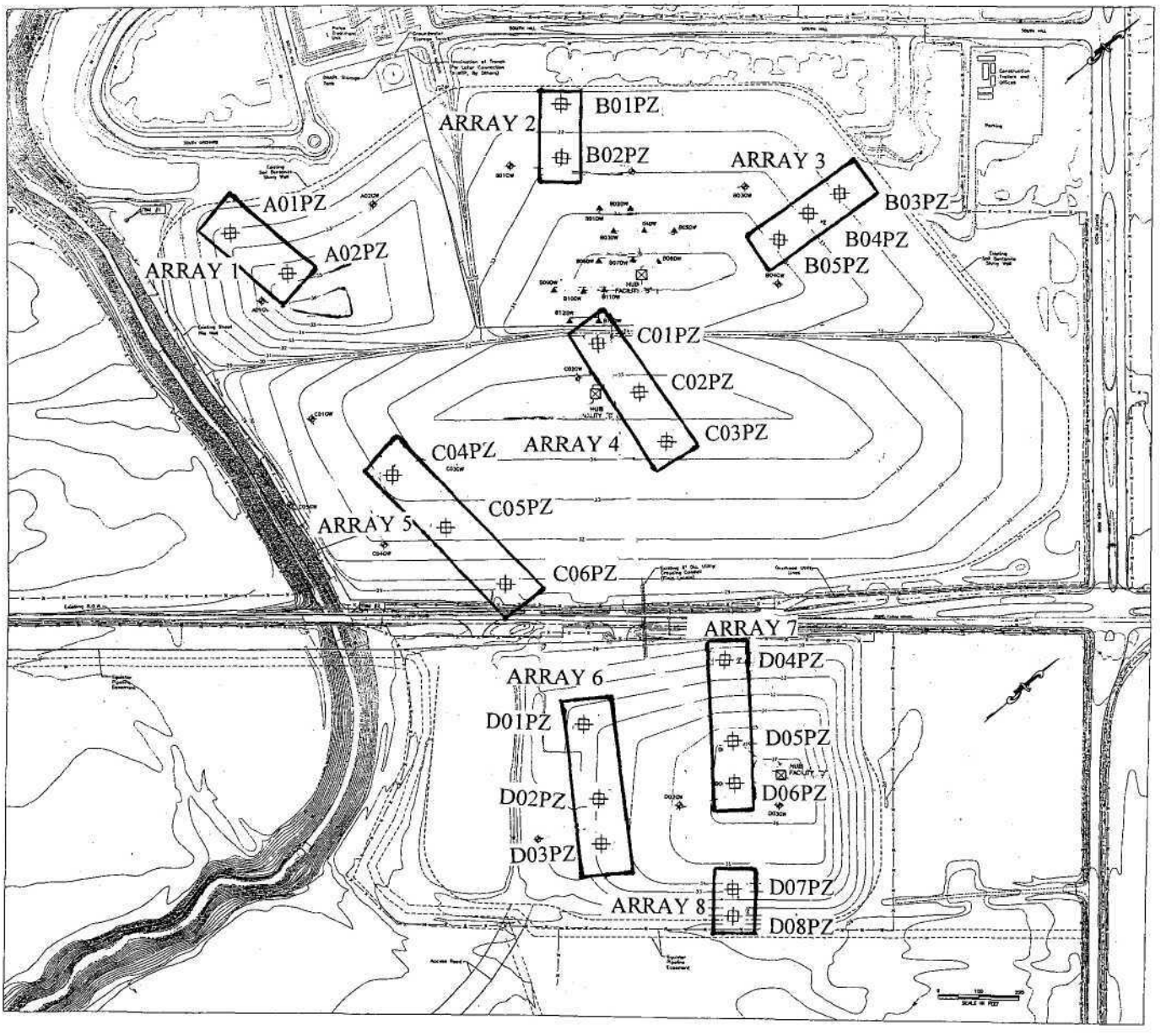


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FIGURE 9
NSCZ PLUME MANAGEMENT FORM

NSCZ PLUME MANAGEMENT

ARRAY #	PIEZOMETER	DATE (mm/dd/yy) and PERSONNEL	(A) DEPTH of GW (feet-TOC)	(B) TOC (feet msl)	(B-A) GW ELEVATION (feet msl)
1	A01PZ				
	A02PZ				
2	B01PZ				
	B02PZ				
3	B03PZ				
	B04PZ				
	B05PZ				
4	C01PZ				
	C02PZ				
	C03PZ				
5	C04PZ				
	C05PZ				
	C06PZ				
6	D01PZ				
	D02PZ				
	D03PZ				
7	D04PZ				
	D05PZ				
	D06PZ				
8	D07PZ				
	D08PZ				

11.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

11.1 PURPOSE AND SCOPE

The purpose of the Quality Assurance/Quality Control Plan (QAQCP) for the Brio Site is to identify testing, data quality objectives, records, and system administration. The QAQCP has been prepared to document the QA/QC measures that will be undertaken by the Brio Site Task Force (BSTF) and its contractors to provide a high level of quality to accomplish project objectives.

Chemical sampling and analyses will include ambient air, groundwater, surface water, and treated water. In addition to the periodic checks for compliance with this QAQCP, periodic checks for compliance with the Brio Site Standard Operating Procedures (SOPs) (Sections 2.0-10.0) will be performed. All results and reports generated through the QA/QC activities will be retained in the project record documents.

11.2 DISTRIBUTION

The Brio Site management is responsible for distribution of all documents relating to the project including this SAP-QAQCP and revisions.

The Brio Site management will maintain all document revisions. An original first issue of all documents will be maintained onsite. In addition, a current version of all MOM documents will be maintained onsite.

11.3 PROJECT ORGANIZATION AND RESPONSIBILITIES

The BSTF and its contractors are staffed with a team qualified and competent persons capable of providing the equipment and services required to implement the Brio Site MOM plan in a coordinated and timely manner to meet or exceed the MOM requirements. This section details QA/QC responsibilities of individuals representing the Brio Site. The Brio Site Organizational Chart is presented in Figure 10.

The BSTF and its contractors will:

- Provide facilities and qualified personnel and provide access to the work areas, as required
- Furnish labor and facilities to obtain and handle samples at the project site, perform inspections and analyses, and provide for storage and preservation (including refrigeration) of samples as necessary

- Collect and deliver representative samples of materials that require analysis including air samples, water samples, and others as required in the MOM Plan. Procedures for collecting samples are presented in Sections 2.0 through 10.0

- Ensure that transportation and ultimate disposition of samples take place in accordance with the appropriate local, state and federal laws

- Provide written documentation and data management of the analytical and inspection results

- Provide results of representative split sampling to the Brio Site management as requested. Make provisions for and assist the USEPA in collecting split samples of onsite materials at their request

- Provide for regular maintenance and calibration of analytical equipment per factory specifications. This maintenance and calibration will be documented and included in the project record documents

- Provide for internal laboratory quality control. Normally five percent (1 in 20) of the total number of samples collected at the Brio Site will be devoted to internal quality control checks. In addition to precision and accuracy testing, reference and other standards will be analyzed as required by the methodology

- Provide for sample container preparation and preservation of samples

- Maintain internal written record keeping and chain of custody for samples

- Promptly submit copies of written reports of analytical results to the Brio Site management. Each report shall include the following:

  (1) Date issued

  (2) Project title and number

  (3) Name, address, and telephone number of the analytical laboratory

  (4) Signature of the laboratory QA Manager, laboratory project manager, or laboratory manager/director

  (5) Date of analysis

  (6) Sample number, identification, and location

  (7) Results of all analyses, including detection limits

(8) Promptly submit copies of any contractor's QC summary reports summarizing quality control experience and actions

11.3.1 Brio Site Management

All work performed at the site is under the direction of the Brio Site management. The Brio Site management's responsibilities are:

- Training field personnel for sampling and QC activities.
- Coordinating activities and efforts of the field and laboratory personnel in order to ensure efficient and effective project performance
- Coordinating and scheduling the project (determine when and where to move the crews, ensuring that proper equipment is at the site when crew arrives, and ensuring all necessary details are handled prior to crew moving to site, etc.)
- Assisting the field personnel with any on-site problems encountered (make arrangements for additional personnel if needed, additional or alternative types of equipment, operational problems, etc.)
- Reporting monitoring results to the BSTF and USEPA as required in the MOM Plan.
- Overall management of QA/QC program

11.3.2 Quality Assurance Manager

Many QA tasks can be performed offsite; therefore, the QA Manager may be an offsite contractor who visits the Brio Site as needed for QA oversight.

The QA Manager's responsibilities include:

- Preparation and maintenance of the QAQCP
- Monitoring for compliance with the QAQCP requirements
- Supporting the Brio Site management
- Coordinating contract laboratory and other technical services
- Auditing lab and systems performance
- Providing QA documentation to be used in Brio Site reports

The QA Manager has the authority to reject data when associated QC data indicate questionable or non-defensible data. The QA Manager also has responsibility to inform BSTF management when it is found that the work being performed is not in compliance with the requirements of the QAQCP, the project specifications, or the Consent Decree.

The QA Manager is responsible for overseeing the QA/QC procedures associated with analytical and sampling methodologies. These responsibilities include, but are not limited to:

- Monitoring and assisting with performance of all sampling procedures
- Monitoring field or operations technicians
- Ensuring proper sample acquisition techniques are employed
- Reviewing sample log books
- Other QA functions outlined in the QA/QC Plan
- Reviewing and approving data generated by contract laboratories
- Performing inspections of the contract laboratories
- Coordinating all activities involving the laboratories if requested by BSTF management
- Coordinate with the contracted laboratories to make sure they are adequately supplied and maintained if requested by BSTF Management
- Reporting analytical data to the Brio Site management if requested by BSTF Management

11.3.3 Field or Operations Technicians

The field or operations technicians are responsible for:

- Following the procedures and requirements set forth in the MOM Plan and SAP-QAQCP.
- Decontaminating sampling equipment
- Sample collection
- Implementing the associated QC requirements

- Documenting sampling activities

11.3.4 Safety and Operations Supervisor (SOS)

The Safety and Operations Supervisor (SOS) reports to the Brio Site management and is on site regularly to implement the Worker Health and Safety Plan and the Spill/Volatile Emission Release Contingency Plan/Emergency Notification Plan (SVERCP/ENP). The SOS's responsibilities are described in the WHASP and the SVERCP/ENP.

11.3.5 Contract Services

Analytical laboratories and/or other contractors may provide:

- QA oversight
- Sample Collection and documentation
- Analytical support for samples collected for chemical analysis
- Laboratory and field auditing
- Data validation
- Generation of Brio Site reports

11.3.6 Contract Laboratory Quality Assurance Manager

The contract laboratory QA Manager is responsible for providing explicit quality control instructions to the laboratory and for assessing laboratory performance. The contract QA Manager is responsible for assigning data qualifiers and informing the Technical Director of analytical problems based on quality control data. The QA Manager also maintains quality control data summaries and control charts. These summaries are presented to the Technical Director and the Corporate Quality Assurance Group for subsequent identification of systematic problems and their resolution.

11.3.7 Role of Contract Laboratories

A description of the contract laboratories and their areas of support includes:

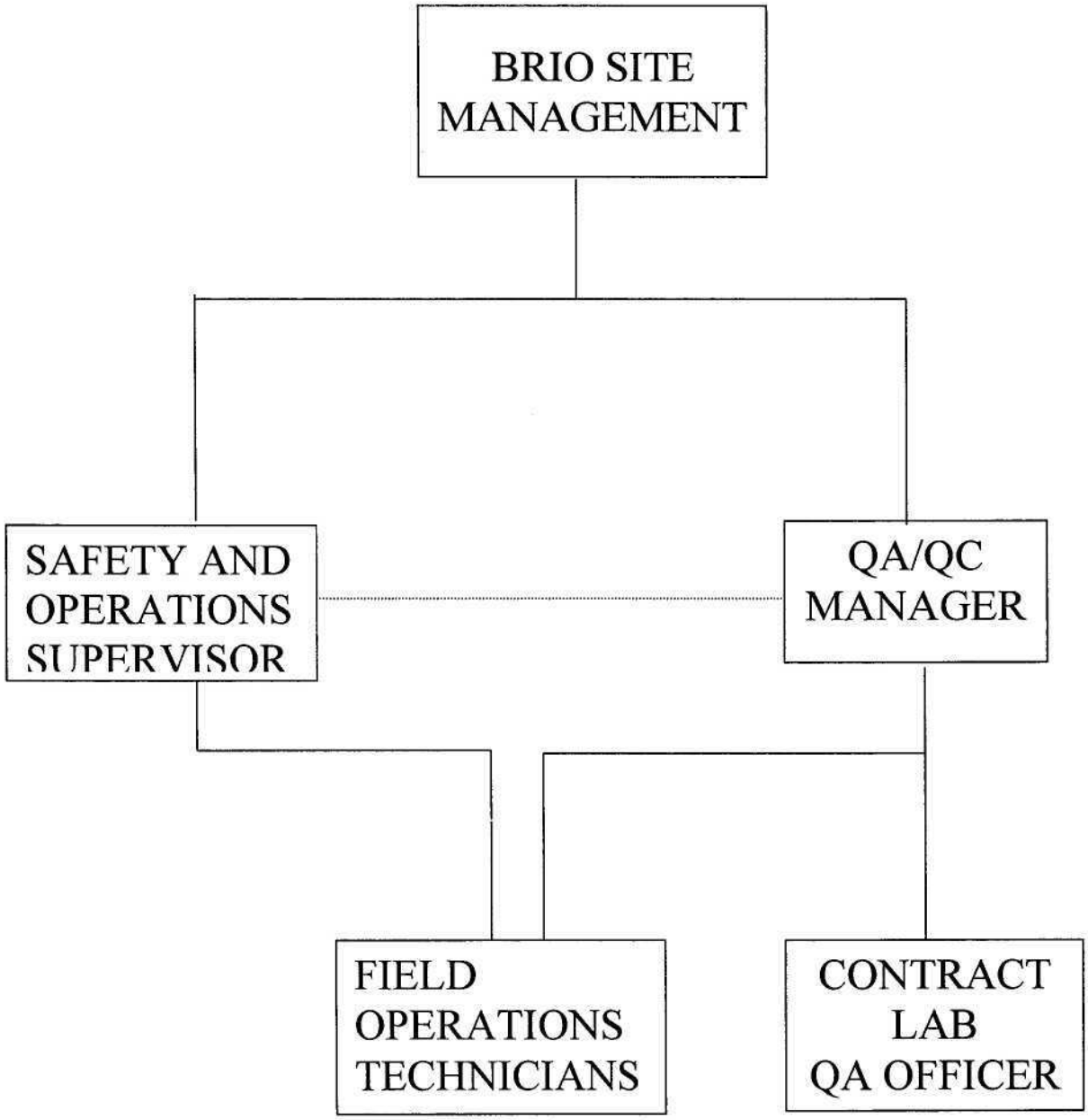
- Analytical Laboratory - chemical analysis of soil, water, air, and waste samples

- Construction Testing/Inspecting - material testing to assure compliance with construction specifications and water well installation at the Brio Site.

The contract laboratories may be coordinated by the BSTF QA Manager who will provide additional review and coordination to facilitate continuity between the laboratory and the Brio Site. Audits by the Brio Site may be made to verify that the contract laboratories' performances meet the requirements set forth in the QA/QC Plan. Each laboratory will be given a copy of the QA/QC Plan to provide a thorough understanding of the project requirements.

In the event a contractor laboratory fails to provide services as required by the project specifications, the QA Manager may recommend that the Brio Site ceases to use that laboratory until the laboratory adequately demonstrates that it has come back into compliance. Should a laboratory fail to regain an acceptable level of compliance, the Brio Site may discontinue use of that laboratory. The laboratory may be used again after satisfactory corrective actions to resolve areas of noncompliance. In the unlikely event that a laboratory fails to provide service suitable to the project requirements, an alternate laboratory may be submitted for approval to the BSTF.

FIGURE 10
BRIO SITE ORGANIZATIONAL CHART



11.4 STANDARD OPERATING PROCEDURES

Standard operating procedures (SOPs) will be developed for both field activities and laboratory analysis. SOPs provide information on sample collection, documentation analysis, and reporting.

Sections 2.0 through 10.0 present the SOPs for field sampling and monitoring activities. The contract laboratory will develop SOPs for laboratory activities.

11.5 ANALYTICAL METHODS

The contract laboratory will use USEPA analytical methods for testing samples collected at the Brio Site. Table 7 presents the methods for the various Brio Site media.

TABLE 7
ANALYTICAL METHODS

MEDIA	ANALYTICAL METHODOLOGY [1]	MOM PLAN REFERENCE	SAP-QAQCP REFERENCE
Treated Water	SW-846	Table 2	Table 1
Surface Water	Modified SW-846 [2]	Table 4	Table 3
FFSZ Groundwater	524	Table 7	Table 2
Air (SUMMA)	TO-14	Table 3C	Table 7

1 See MOM Plan or SAP-QAQCP reference for individual parameters
2 Method SW-846 8260 modified to achieve detection limit for 1,1-dichloroethene of no greater than 0.50 µg/l

11.6 DATA QUALITY OBJECTIVES

11.6.1 Precision and Accuracy

The BSTF will request the laboratory to perform precision and accuracy measurements on no fewer than five percent (1 in 20) of all Brio Site samples.

Precision and accuracy of data will take into consideration the guidelines established in the accuracy and precision sections of the appropriate methodology implemented. The laboratory will use precision and accuracy data to evaluate the usefulness of the analytical data and to develop corrective actions.

Methods lacking precision and accuracy data will be studied by the contract laboratory to develop criteria. Precision and accuracy data will be collected from the data for matrix spikes and matrix spike duplicates. (Additional sampling and analytical precision data will be collected from the analytical results for duplicate samples).

11.6.2 Blanks

Field, trip, and rinse blanks will be collected in order to verify that the sample collection, handling, and shipping process have not affected the quality of the samples. Blank samples will be collected, in same size and type of container, numbered, packaged, and sealed in the same manner as the other samples.

Field and Trip Blanks will only be analyzed for the volatile organic compounds.

Field blanks will be collected by pouring an appropriate amount of blank water into the appropriate sample containers while in the field at the location of an actual field sample. Field blanks will be collected at a frequency of 1 blank per 20.

Rinse blanks will be collected by pouring an appropriate amount of blank water into or through a decontaminated sampling device and into the appropriate sample containers. Rinse blanks will be collected at a frequency of 1 blank per 20 samples.

Trip blanks are samples of analyte-free media prepared by the laboratory and taken to the sampling site and returned to the laboratory unopened. Trip blanks will be prepared by the analytical laboratory using analyte-free water for liquid matrices or sand for solid matrices, and sent in the sample containers to the field sampling site. Trip blanks will be utilized at a frequency of 1 blank per 20 samples.

11.6.3 Field Duplicate Samples

Field duplicate samples will be collected to verify the laboratory and field procedures. They are identical samples collected at the same time, using the same methods; and are contained, preserved, and transported in the same manner as other samples to verify the reproducibility of the data. Field duplicates may be submitted blind to the laboratory performing the analyses. One duplicate per 20 samples will be submitted for analysis. A duplicate sample will be noted in the field logbook as a duplicate. Field duplicate samples may be assigned a unique sample identification that does not indicate to the lab that the sample is a quality assurance sample.

11.6.4 Analytical Completeness

The analytical completeness objective for compliance samples will be a minimum of 95% of all samples collected.

11.6.5 Sample Holding Times

Sample holding times will begin when the sample is collected and analysis will be implemented within the holding times indicated for each specific parameter as referenced in Table 8.

TABLE 8
HOLDING TIMES

MEDIA	SAP-QAQCP REFERENCE
Treated Water	Table 1
Surface Water	Table 3
FFSZ Groundwater	Table 2
Air (SUMMA)	Table 6

11.7 SAMPLE DOCUMENTATION AND CUSTODY

Sampling information will be recorded in a field logbook. Each sample bottle will be labeled, a chain of custody will be completed, and sample shipping containers will have custody seals. Section 3.0 presents the procedures for proper documentation and custody.

11.8 INSTRUMENT CALIBRATION

Calibration procedures for specific analytical methodologies will be included with the approved analytical laboratory's QA Program Plan, and the instrument operating manuals. Field equipment will be calibrated according to the manufacturer's recommendations.

11.9 TRAINING

Both laboratory and field personnel will be trained to perform the sampling or analysis tasks assigned to them. Training will emphasize QA/QC and will be documented.

11.10 DATA REDUCTION, VALIDATION, AND REPORTING

The laboratory will provide an analysis reporting system that is designed to produce complete, defensible, and accurate data. All samples collected for compliance purposes will be reported in a format that allows for validation by a third party. The FFSZ groundwater monitoring reports will be validated.

11.11 PERFORMANCE AND SYSTEMS AUDITS

The laboratory will be audited as required by BSTF management. The laboratory will develop and follow a QA/QC Plan. This QA/QC Plan will serve as a basis for establishing audit criteria.

11.12 FIELD AND LABORATORY PREVENTIVE MAINTENANCE

Prior to project activity utilizing equipment for the purpose of sampling and testing, all such equipment will be checked and calibrated, where applicable, by either standard procedures or instructions provided by the manufacturer of the equipment. Periodic maintenance will also be provided and will include routine servicing, cleaning, recalibration, and the replacement of parts as required.

Reference to equipment maintenance for the contract laboratory will be defined in the laboratory QA/QC Manual. In the event of an analytical and/or sampling equipment failure at the contract laboratory, any malfunction that could alter or result in the absence of analytical data that could be critical to making determinations regarding safety, health, environmental standards or project work changes will be made known to BSTF Management.

11.13 CORRECTIVE ACTION

The criteria for triggering corrective action will include (but is not limited to) unacceptable spike recoveries and duplicate results, loss of sample due to breakage or consumption during testing, missed holding times, improper preservation, improper documentation of sampling or analysis, and transcription errors on analytical reports.

The laboratory or personnel responsible for the corrective action will provide the QA/QC Laboratory Manager with a memorandum stating the problem and corrective action taken.

On-site corrective actions are necessary for actions on-site that are out of compliance with site policies, procedures, design requirements or this QAQCP. The on-site out of compliance action and the corresponding corrective action will be documented and retained in the Brio Site

files.

The QA/QC Manager or his designee will approve on-site corrective actions and track unresolved on-site corrective actions until approved.

11.14 QUALITY ASSURANCE REPORTING

Compliance with this QA/QA Plan will be documented annually in the Annual Effectiveness Report. The following quality aspects will be reviewed for compliance throughout the year and summarized in the Annual Effectiveness Report:

- Analytical precision frequency and results
- Analytical accuracy frequency and results
- Analytical blank frequency and results
- Analytical detection limits
- Analytical completeness
- Analytical holding times
- Field sample collection
- Chain of custody documentation
- Field log documentation
- Laboratory and field calibration
- Field employee training
- Corrective action reports

APPENDIX D

NSCZ GROUNDWATER RECOVERY WELL, DNAPL RECOVERY WELL, AND PIEZOMETER CONSTRUCTION REPORTS

Sh. 1 of 1

WELL NUMBER: A 01 GW

PROJECT: GW Recovery Wells LOCATION: Brio North Side

TOTAL WELL DEPTH (Ft. BGS) 48.93 BOREHOLE DIA. (in) 12 STICKUP (ft) 4.57

CASING DIA. (in) 4 TYPE: Stainless Steel SCREEN LENGTH (ft) ~~30.0~~ 15.0 SLOT SIZE (in) 0.010

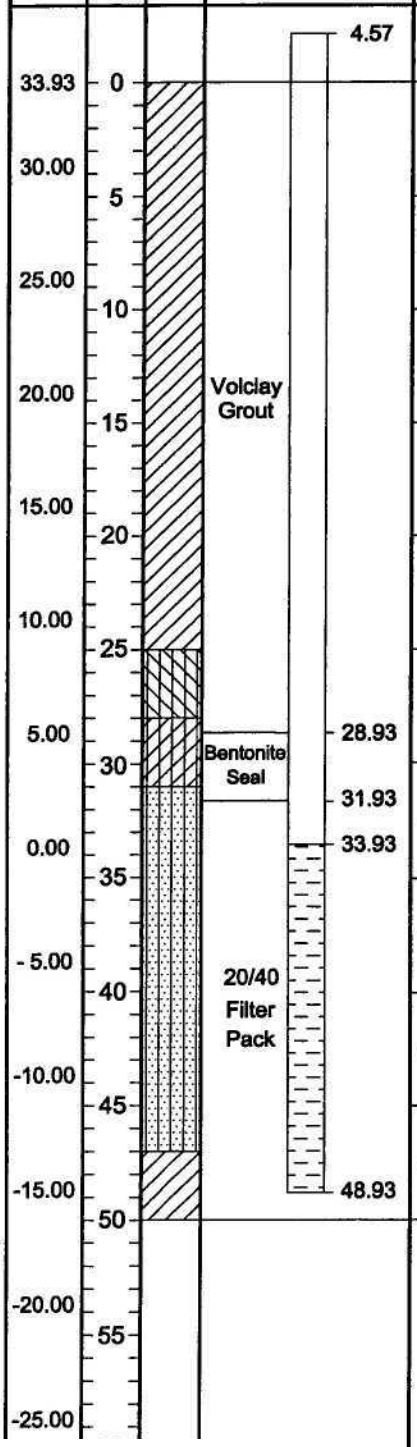
DRILLING COMPANY Fugro DRILLING METHOD Hollow Stem Auger

GEOLOGIST Scott Ude DATE DRILLED 6/04/02

TOP OF CASING ELEVATION (Ft-MSL) _____ GROUND SURFACE ELEVATION (Ft-MSL) 33.93

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
3.5 5.0 5.0 5.0 5.0	Clay (CH), tan and red-brown, damp, very stiff - 4.5' former vegetation surface - 5.0 -10.0' common rootlets - 8.0 - 8.5' silty clay zone, wet, soft - 8.5 - 9.0' crumbly silty clay zone - 9.0 -15.5' gray and tan - 15.5' red-brown, damp, high plasticity - 24.5 -31.0' tan and gray
5.0	Silty Clay (CL), gray and tan, damp to wet, stiff, high plasticity
	Clayey Silt (ML), tan and gray, saturated, soft, moderately cohesive
4.0 4.5 2.0	Silty Sand (SM), very fine-grained, red-brown and minor gray, saturated, soft to flowing - 34.5 - 35.0' silty clay, red-brown, damp, firm - 35.0 - 40.0' silty sand to sandy silt, red-brown and gray, saturated to flowing
4.0	Clay (CH), damp, red-brown, very stiff with minor saturated Clayey Silt (ML) seams to 2 inches thick, red-brown, damp

002139

WELL NUMBER: A 02 GW

PROJECT: GW Recovery Wells LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 43.35 BOREHOLE DIA. (in) 12 STICKUP (ft) 4.65

CASING DIA. (in) 4 TYPE: Stainless Steel SCREEN LENGTH (ft) 15.0 SLOT SIZE (in) 0.010

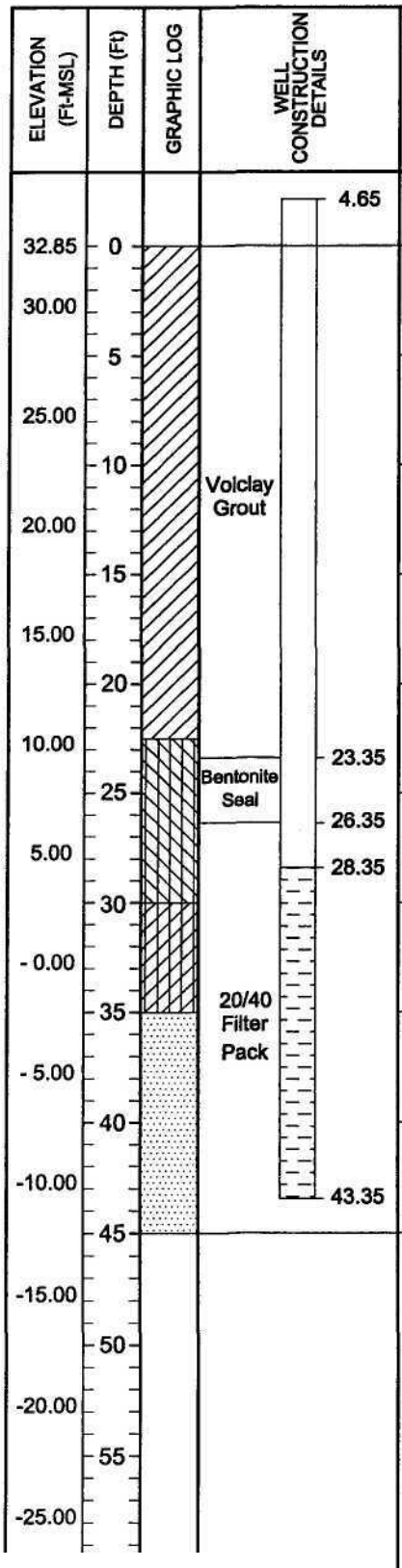
DRILLING COMPANY Fugro DRILLING METHOD Hollow Stem Auger

GEOLOGIST Scott Ude DATE DRILLED 6/05/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 32.85

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
3.5 5.0 4.0 5.0 5.0	Clay (CH), red-brown, gray to dark gray, damp, firm - 4.5 - 5.5' dark gray to black - 5.4' former vegetation surface - 5.9 - 9.0' common rootlets - 5.5 - 9.0' gray to dark gray - 9.0 - 12.5' gray - 12.5 - 12.8' crumbly calcareous-rich zone in clay matrix - 12.8 - 22.5' red-brown and gray, high plasticity
5.0 5.0	Silty Clay (CL) to Clayey Silt (ML), gray and red-brown, damp, firm, silty zones are saturated, soft
5.0	Clayey Silt to (ML), red-brown and gray, saturated, silty zones are flowing
2.5 2.5	Sand (SW), very fine-grained, tan, saturated, flowing

002140

WELL NUMBER: A 01 PZ

PROJECT: Piezometers LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 44.17 BOREHOLE DIA. (in) 8 7/8 STICKUP (ft) 3.58

CASING DIA. (in) 1 TYPE: Stainless Steel SCREEN LENGTH (ft) 10.0 SLOT SIZE (in) 0.010

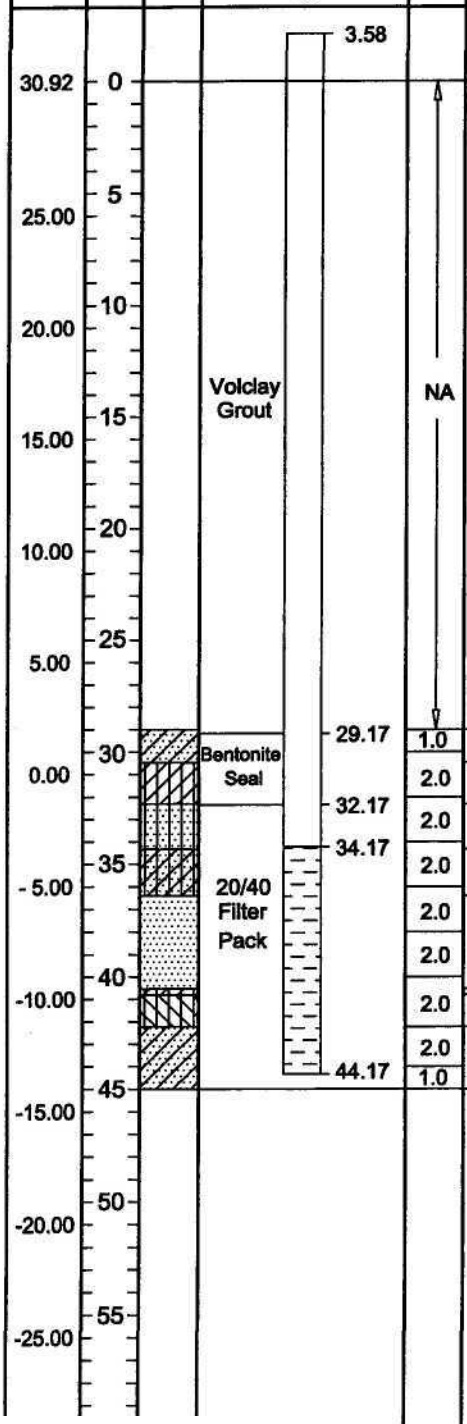
DRILLING COMPANY CCI DRILLING METHOD Hollow Stem Auger

GEOLOGIST Samuel Cheek DATE DRILLED 5/23/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 30.92

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
	- 0 - 29.0' bgs (below ground surface) drilled without sampling
NA	
1.0	Clayey Sand (SC), very fine-grained, red-brown, saturated, soft, slightly cohesive, calcareous nodules (< 1 cm)
2.0	Clayey Silt (ML), red-brown, wet, soft, slightly cohesive, increase in clay amount to 32.2
2.0	Silty Sand (SM), very fine-grained, red-brown, saturated, soft, slightly cohesive - 33.0 - 34.1 flowing
2.0	Sandy Silty Clay (CL), red-brown, moist, firm
2.0	Sand (SW), very fine-grained, red-brown, saturated, soft, slightly cohesive to flowing
2.0	
	Clayey Silt (ML), red-brown, moist, soft, slightly cohesive
2.0	Silty Clay (CL), red-brown, damp, firm, minor sand content
2.0	Clayey Sand (SC), very fine-grained, red-brown, wet, soft, slightly cohesive - 43.1 - 45.0 saturated, flowing, grain size increases to fine, with a decrease in clay content
1.0	

002141

WELL NUMBER: A 02 PZ

PROJECT: Piezometers LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 49.13 BOREHOLE DIA. (in) 8 7/8 STICKUP (ft) 2.62

CASING DIA. (in) 1 TYPE: Stainless Steel SCREEN LENGTH (ft) 10.0 SLOT SIZE (in) 0.010

DRILLING COMPANY CCI DRILLING METHOD Hollow Stem Auger

GEOLOGIST Samuel Cheek DATE DRILLED 5/23/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 34.38

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION

ELEVATION (Ft-MSL)	DEPTH (Ft)	WELL CONSTRUCTION DETAILS	SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
34.38	0	2.62		
		Volclay Grout	NA	- 0 - 34.0' bgs (below ground surface) drilled without sampling
0.00	35	Bentonite Seal 34.13	2.0	Sand (SW), very fine-grained, red-brown, saturated, flowing
				Silty Clay (CL), red-brown, moist, stiff
		37.13	2.0	
- 5.00	40	39.13	2.0	Sand, very fine-grained, with minor Clay (SC), red-brown, saturated, soft, slightly cohesive
			2.0	- 37.2 - 37.8 increasing clay content
		20/40 Filter Pack	2.0	
-10.00	45		2.0	Silty Clay (CL), red-brown, moist, firm, stiff
			2.0	Sand, very fine-grained, red-brown, saturated, slightly cohesive, minor clay content increasing to 47.8'
-15.00	50	49.13	2.0	Silty Clay (CL), red-brown, moist, firm
				Sand (SW), very fine-grained, red-brown, saturated, flowing
-20.00	55			

002142

WELL NUMBER: B 01 GW

PROJECT: GW Recovery Wells LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 46.57 BOREHOLE DIA. (in) 12 STICKUP (ft) 5.68

CASING DIA. (in) 4 TYPE: Stainless Steel SCREEN LENGTH (ft) 15.0 SLOT SIZE (in) 0.010

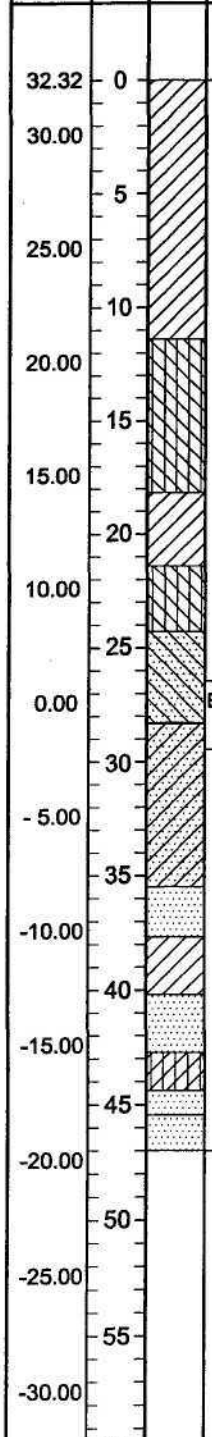
DRILLING COMPANY CCI DRILLING METHOD Hollow Stem Auger

GEOLOGIST Samuel Cheek DATE DRILLED 5/28/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 32.32

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
1.5	Clay (CH), dark gray, dry to damp, firm, minor iron nodules
2.0	- 2.1 - 4.3' red-brown color
2.0	- 4.3 - 11.3' damp with minor silt content, moderate plasticity
2.0	- 9.5 - 11.3' tan and gray, calcareous nodules
2.0	
2.0	
2.0	Silty Clay (CL), tan and gray, damp, firm, minor calcareous nodules and iron nodules
2.0	- 16.2 - 18.1' decreasing silt content
2.0	
2.0	Clay (CH), tan and gray, dry, firm
2.0	
2.0	Silty Clay (CL), gray, damp, firm
2.0	Sandy Clay (CL), tan and gray, damp, firm, calcareous nodules
2.0	- 24.4 - 24.7' pocket of calcareous nodules
2.0	- 28.1 - 28.5' saturated
2.0	Clayey Silt (CL-ML), red-brown, moist, soft, slightly cohesive
2.0	- 31.3' increase in sand with decrease in clay
2.0	
2.0	Sand (SW), very fine-grained, red-brown, saturated, soft
2.0	Clay (CH), red-brown, damp, very stiff; tan and gray silt/sand seams throughout clay
2.0	Sand (SW), very fine-grained, red-brown, wet, soft, noncohesive, minor to common DNAPL
2.0	Silty Clay (CL), red-brown, damp, firm, minor DNAPL throughout
2.0	Sand (SW), very fine-grained, red-brown, saturated, flowing
1.0	Sandy Silty Clay (CL), red-brown, damp, firm, minor DNAPL throughout

Sh. 1 of 1

WELL NUMBER: B 02 GW

PROJECT: GW Recovery Wells LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 48.36 BOREHOLE DIA. (in) 12 STICKUP (ft) 4.39

CASING DIA. (in) 4 TYPE: Stainless Steel SCREEN LENGTH (ft) 20.0 SLOT SIZE (in) 0.010

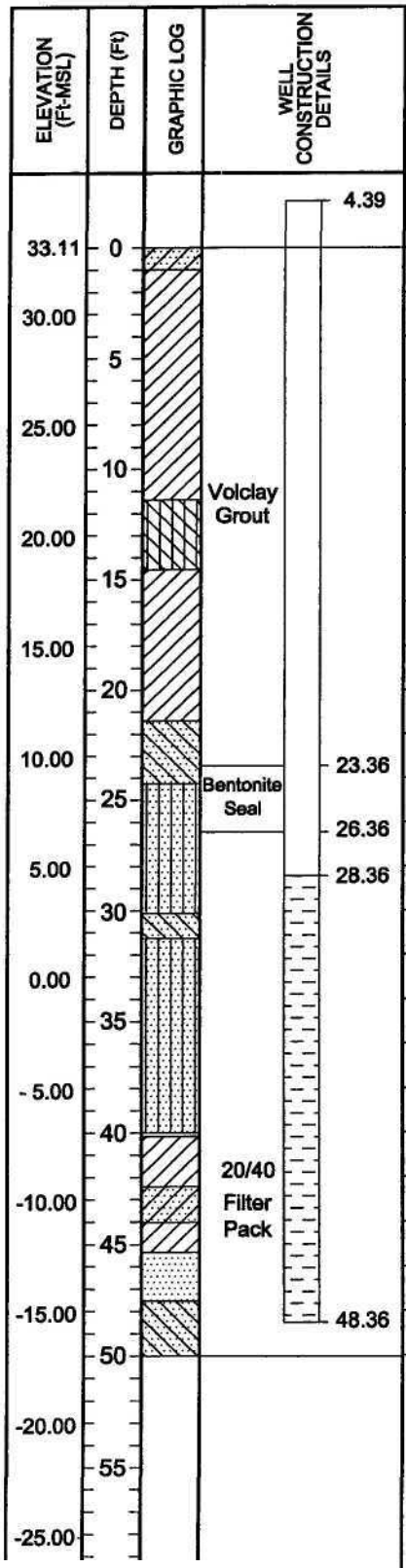
DRILLING COMPANY CCI DRILLING METHOD Hollow Stem Auger

GEOLOGIST Samuel Cheek DATE DRILLED 5/30/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 33.11

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
1.5	Clayey Sand (SC), very fine-grained, red-brown, damp, soft, crumbly
2.0	Clay (CH), dark brown, dry, firm, stiff, minor iron nodules, rootlets
2.0	- 3.5 - 4.0' gravelly road base
2.0	- 5.6 - 11.3' soft, minor silt
2.0	- 8.2 - 11.3' gray
2.0	
2.0	
2.0	Silty Clay (CL), tan to gray, damp, soft, minor iron nodules, minor calcareous nodules
2.0	
2.0	Clay (CH), tan to gray, damp, firm, stiff, very minor silt
2.0	
2.0	
2.0	
2.0	Sandy Clay (CL), red-brown, wet, soft, sand concentrated in seams
2.0	Silty Sand (SM), very fine-grained, gray, saturated, soft, calcareous nodules
2.0	- 25.8' becomes red-brown, slightly cohesive
2.0	- 26.2 - 26.8' minor clay content
2.0	Sandy Clay (CL), red-brown, damp, firm
2.0	Sandy Silt (ML), red-brown, wet, soft, plastic, minor clay content
2.0	- 34.1 - 40.3' minor DNAPL, increasing clay content
2.0	- 38.3 - 39.7' silty sand, red-brown, saturated, soft,
2.0	slightly cohesive, very minor clay content
2.0	Clay (CH), red-brown, damp, firm, stiff, minor DNAPL 40.3 - 42.3
2.0	Clayey Sand (SC), very fine-grained, red-brown, saturated, slightly cohesive, minor silt
	- 42.3 - 42.6' abundant DNAPL
2.0	Clay (CH), red-brown, damp, firm, stiff
	- 44.0 - 45.2' common DNAPL
2.0	Sand (SW), very fine-grained, red-brown, wet to saturated, flowing, DNAPL abundant 46.1 - 46.3
2.0	Sandy Clay (CL), red-brown, damp, firm
	- 47.6 - 50.0' minor to common DNAPL
	- 48.1 - 48.3' abundant DNAPL

002144

Sh. 1 of 1

WELL NUMBER: B 03 GW

PROJECT: GW Recovery Wells LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 45.91 BOREHOLE DIA. (in) 12 STICKUP (ft) 4.84

CASING DIA. (in) 4 TYPE: Stainless Steel SCREEN LENGTH (ft) 20.0 SLOT SIZE (in) 0.010

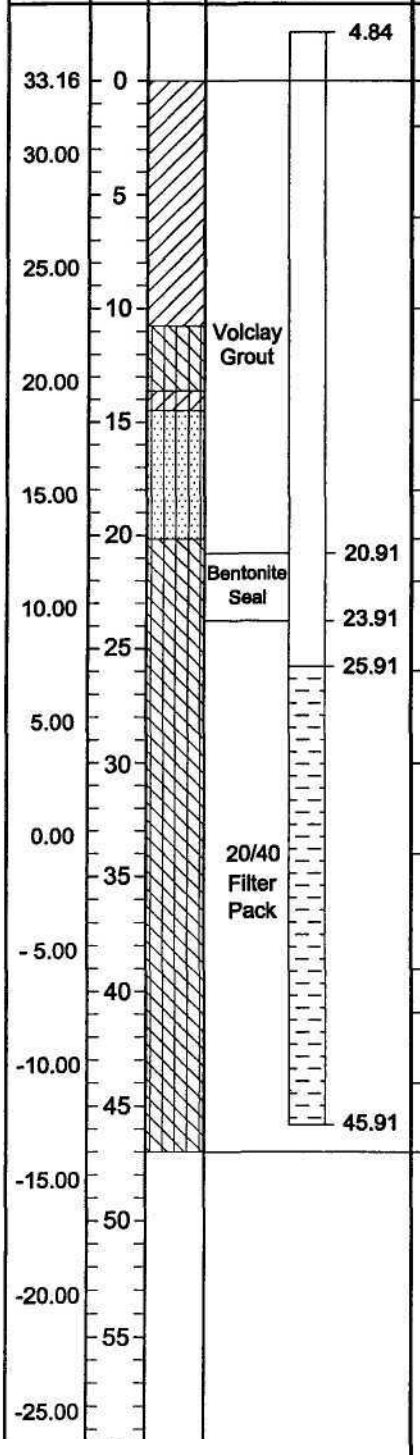
DRILLING COMPANY CCI DRILLING METHOD Hollow Stem Auger

GEOLOGIST Samuel Cheek DATE DRILLED 6/03/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 33.16

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



LITHOLOGIC DESCRIPTION

Clay (CH), dark gray, dry, stiff, small calcareous nodules and iron nodules

- 5.9 - 6.3' light brown, sandy material, road base
- 6.3 - 10.9' gray to light gray

Silty Clay (CL), gray, damp, firm, plastic, calcareous nodules

Clayey Silt (ML), red-brown, damp, soft, slightly cohesive

Silty Sand (SM), red-brown, saturated, soft, slightly cohesive

Alternating layers of Silty Clay (CL), red-brown, damp, stiff to very stiff, minor calcareous nodules; and Clayey Silt (ML), wet to saturated, soft, slightly cohesive

- 25.9 - 26.3' clayey silt layer
- 26.3 - 33.2' silty clay layer
- 33.2 - 34.8' clayey silt layer
- 34.8 - 36.2' silty clay layer
- 36.2 - 38.4' clayey silt layer
- 38.4 - 38.9' silty sand, very fine-grained, seam, red-brown, saturated
- 38.9 - 41.3' clayey silt layer
- 41.3 - 47.0' silty clay layer

002145

WELL NUMBER: B 04 GW

PROJECT: GW Recovery Wells LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) _____ BOREHOLE DIA. (in) 12 STICKUP (ft) 4.78

CASING DIA. (in) 4 TYPE: Stainless Steel SCREEN LENGTH (ft) 20.0 SLOT SIZE (in) 0.010

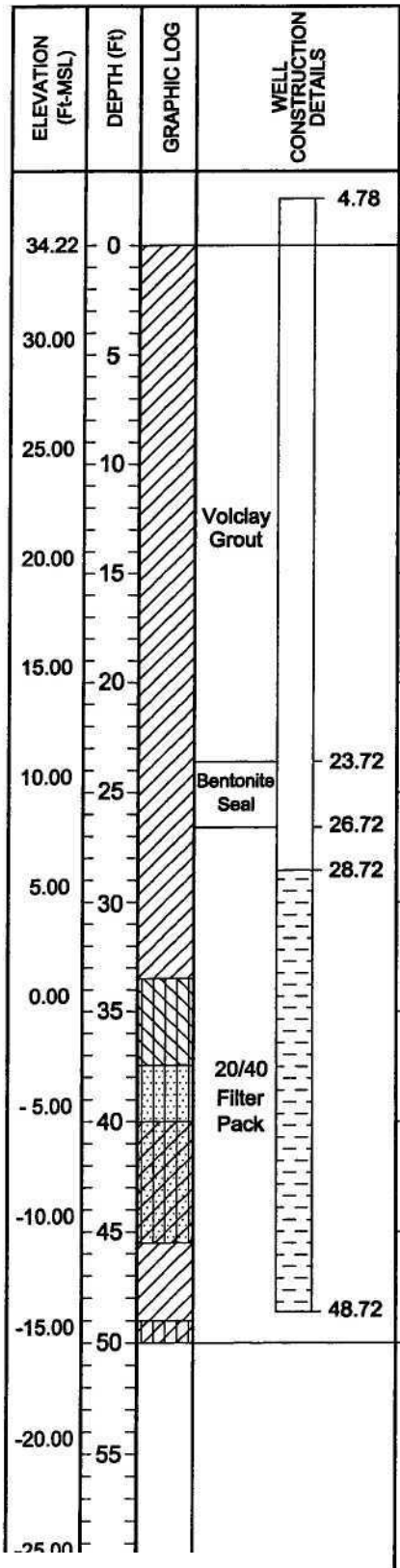
DRILLING COMPANY Fugro DRILLING METHOD Hollow Stem Auger

GEOLOGIST Scott Ude DATE DRILLED 5/30/02

TOP OF CASING ELEVATION (Ft-MSL) _____ GROUND SURFACE ELEVATION (Ft-MSL) 34.22

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
5.0	Clay (CH), damp, firm to very stiff
4.0	- 0.0 - 2.0' red-brown
5.0	- 2.0 - 4.0' dark brown, tan and red-brown
5.0	- 4.0 - 10.0' dark brown to dark gray
5.0	- 5.5' former vegetation surface, common rootlets to 10'
5.0	- 10.0 - 14.0' dark gray
5.0	- 14.0 - 16.0' gray and tan with minor red-brown
5.0	- 16.0 - 23.0' red-brown, very stiff
5.0	- 23.0 - 27.5' gray and tan, very stiff, very minor calcareous nodules
5.0	- 25.0 - 27.5' sandy clay, gray and tan, wet to saturated, soft
5.0	- 28.5 - 29.0' silt zone, red-brown and gray, saturated, soft
5.0	- 29.0 - 33.5' clay, red-brown, damp, very stiff
5.0	Silt (ML) to Silty Clay (CL), red-brown and gray, saturated, common DNAPL in pore spaces
5.0	Silty Sand (SM), tan, saturated, common DNAPL, noncohesive to flowing
4.0	Intermixed zones <1' thick of clay, silt, and silty sand; sand-rich zones at 41.0 - 41.3 and 43.5 - 43.8' hydrocarbon sheen on saturated sand zones; DNAPL in pore spaces
4.0	Clay (CH), red-brown, damp, very stiff, no visible DNAPL
	Silty Clay to Clayey Silt (CL-ML), red-brown, saturated, no visible DNAPL

002146

WELL NUMBER: B 05 GW

PROJECT: GW Recovery Wells LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 48.91 BOREHOLE DIA. (in) 12 STICKUP (ft) 5.59

CASING DIA. (in) 4 TYPE: Stainless Steel SCREEN LENGTH (ft) 15.0 SLOT SIZE (in) 0.010

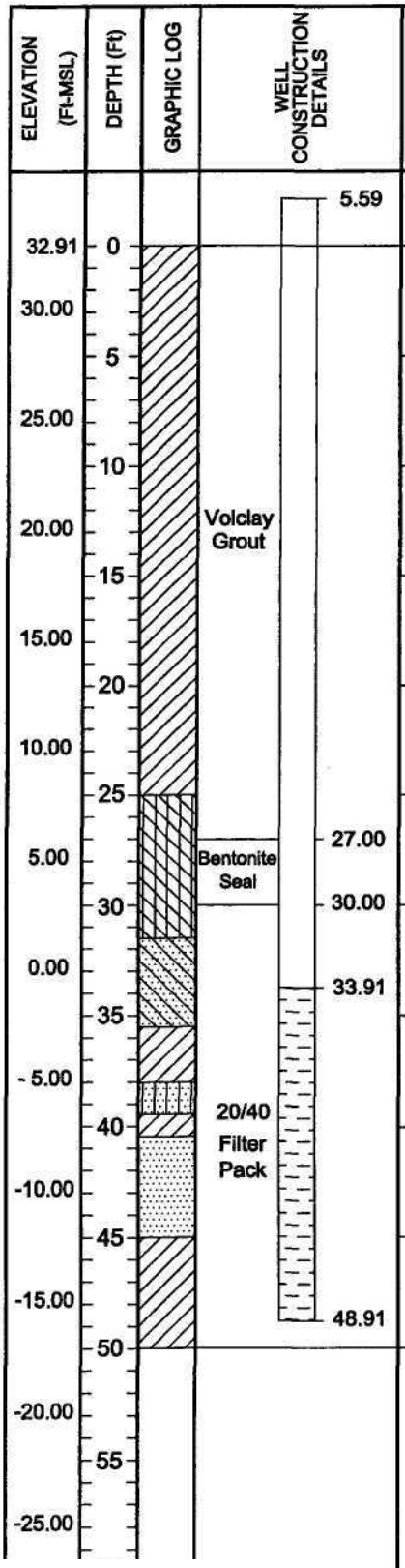
DRILLING COMPANY Fugro DRILLING METHOD Hollow Stem Auger

GEOLOGIST Scott Ude DATE DRILLED 5/28/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 32.91

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
4.0	Clay (CH), damp, firm, high plasticity - 4.5' dark gray to black, minor oyster shell hash, slightly crumbly - 5.5' former vegetation surface - 5.5 - 9.0' common rootlets
5.0	- 10.0' gray and tan clay, damp, firm
5.0	- 14.0' 2" layer at calcareous nodules - 14.5' red-brown and gray, damp, firm, high plasticity
5.0	- 22.5' gray and tan
5.0	- 24.0' water on the outside of the core
5.0	Silt Clay (CL) to Clay (CH), red-brown, gray and tan, wet, firm, moderate to high plasticity
5.0	Sandy Clay (CL) to Clayey Sand (SC), red-brown and gray, saturated, DNAPL in pore spaces beginning at 32'
5.0	Clay (CH), red-brown, wet, firm, minor DNAPL
	Silty Sand (SM) to Sandy Silt (ML), red-brown, saturated, slightly cohesive to flowing, common DNAPL
	Clay (CH), red-brown, saturated, firm, minor DNAPL
5.0	Sand (SW), very fine-grained, tan, saturated, flowing
5.0	Clay (CH), red-brown, saturated, very stiff - 46.5 - 47.5' silty sand, saturated, DNAPL - 47.5 - 48.5' silty clay with sandy seams, minor DNAPL

002147

WELL NUMBER: B 01 PZ

PROJECT: Piezometers LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 40.97 BOREHOLE DIA. (in) 8 7/8 STICKUP (ft) 2.28

CASING DIA. (in) 1 TYPE: Stainless Steel SCREEN LENGTH (ft) 10.0 SLOT SIZE (in) 0.010

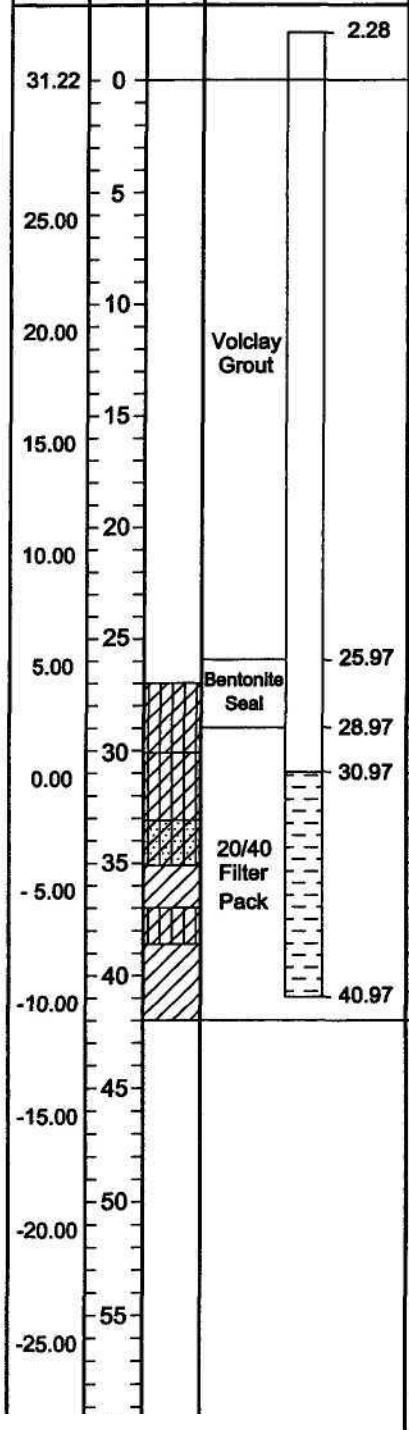
DRILLING COMPANY CCI DRILLING METHOD Hollow Stem Auger

GEOLOGIST Samuel Cheek DATE DRILLED 5/22/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 31.22

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
	- 0 - 27.0' bgs (below ground surface) drilled without sampling
NA	
2.0	Silty Clay (CL), gray, red brown, moist, soft
2.0	- 28.1 - 29.7 clay (CH), red-brown, moist, stiff
2.0	- 29.7 - 30.1 red-brown
2.0	Clayey Silt (ML), red-brown, wet, soft, small calcareous nodules
2.0	Clayey Silty Sand (SM), very fine-grained, red-brown, wet, soft, well-sorted
2.0	Clay (CH), red-brown, damp, very stiff
2.0	Clayey Silt (ML), red-brown, wet, soft, slightly cohesive
2.0	Clay (CH), red-brown, damp, very stiff
1.0	

002148

Sh. 1 of 1

WELL NUMBER: B 02 PZ

PROJECT: Piezometers LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 44.05 BOREHOLE DIA. (in) 8 7/8 STICKUP (ft) 2.70

CASING DIA. (in) 1 TYPE: Stainless Steel SCREEN LENGTH (ft) 10.0 SLOT SIZE (in) 0.010

DRILLING COMPANY CCI DRILLING METHOD Hollow Stem Auger

GEOLOGIST Samuel Cheek DATE DRILLED 5/22/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 32.30

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION

ELEVATION (Ft-MSL)	DEPTH (Ft)	WELL CONSTRUCTION DETAILS	SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
		2.70		
32.30	0			
30.00	5	Volclay Grout	NA	- 0 - 29.0' bgs (below ground surface) drilled without sampling
25.00	10			
20.00	15			
15.00	20			
10.00	25			
5.00	30	Bentonite Seal	2.0	Clayey Sand (SC), very fine-grained, red-brown, wet, soft, slightly cohesive
		29.05		- 31.0 - 31.6 saturated
0.00			2.0	- 31.6 - 31.9 increasing clay content
		32.05		- 31.9 - 33.0 increasing sand, saturated
	35	20/40 Filter Pack	2.0	Silty Clay (CL), red-brown, moist, firm, stiff
		34.05	2.0	- 37.3 - 38.1 DNAPL in pore spaces
- 5.00			1.5	Clayey Silt (ML), red-brown, moist, soft, DNAPL present
	40		2.0	Silty Clay (CL), red-brown, moist, stiff, DNAPL in thin gray silt seam
-10.00			2.0	- 39.8 - 42.2 increasing clay
	45	44.05	2.0	Clay (CH), red-brown, moist, very stiff, DNAPL present in sand seam
-15.00				Silty Sand (SM), red-brown, wet, soft, slightly cohesive, DNAPL at 44.1 - 45.0
	50			
-20.00				
	55			
-25.00				

002149

WELL NUMBER: B 03 PZ

PROJECT: Piezometers LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 41.75 BOREHOLE DIA. (in) 8 7/8 STICKUP (ft) 2.25

CASING DIA. (in) 1 TYPE: Stainless Steel SCREEN LENGTH (ft) 10.0 SLOT SIZE (in) 0.010

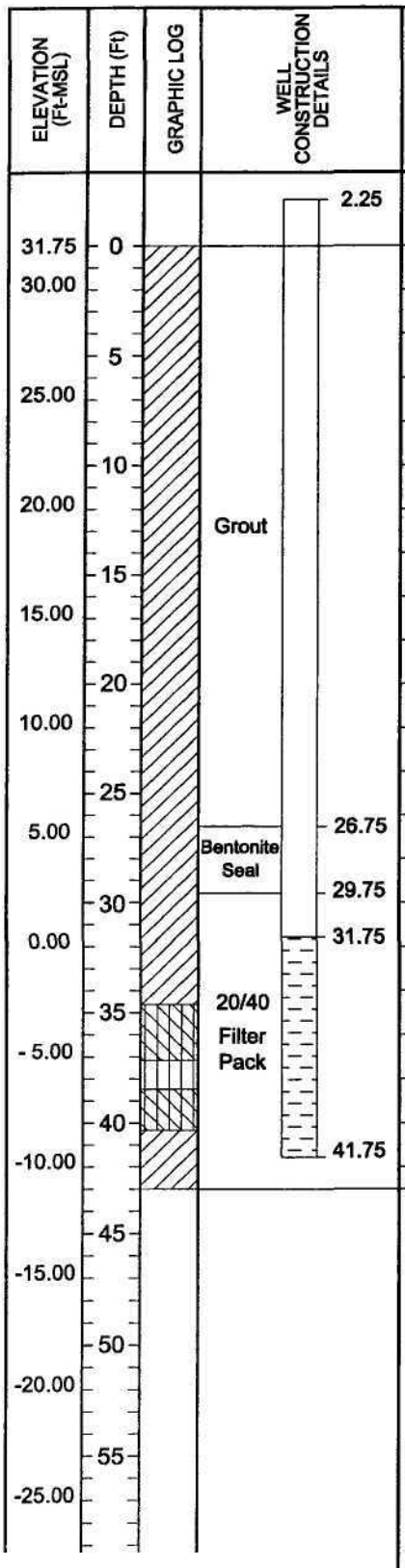
DRILLING COMPANY CCI DRILLING METHOD Hollow Stem Auger

GEOLOGIST Samuel Cheek DATE DRILLED 5/20/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 31.75

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
1.5	Clay (CH), brown, damp, small calcareous nodules, soft to firm, minor iron nodules
1.1	- 1.8 - 1.9 grassy zone
2.0	- 1.9 - 8.5 common rootlets
2.0	- 8.5 - 10.8 red-brown with increase in amount of iron nodules
2.0	- 10.8 - 16.2 very minor silt within clay
2.0	- 20.3 - 27.1 gray, tan, red-brown
2.0	- 27.1 - 27.15 minor sand inclusions
2.0	
2.0	
2.0	
2.0	
2.0	
2.0	
2.0	
2.0	
2.0	
2.0	
2.0	
2.0	
2.0	
2.0	
2.0	Silty Clay (CL), gray, tan and brown, moist, soft, cohesive
2.0	Silt (ML), very fine-grained, tan, saturated, soft, slightly cohesive
2.0	Silty Clay (CL), tan-brown, damp, firm, stiff
2.0	Clay (CH), brown, damp, firm, saturated, lenses of sand / silt
1.0	

002150

WELL NUMBER: B 04 PZ

PROJECT: Piezometers LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 42.70 BOREHOLE DIA. (in) 8 7/8 STICKUP (ft) 2.55

CASING DIA. (in) 1.0 TYPE: Stainless Steel SCREEN LENGTH (ft) 10.0 SLOT SIZE (in) 0.010

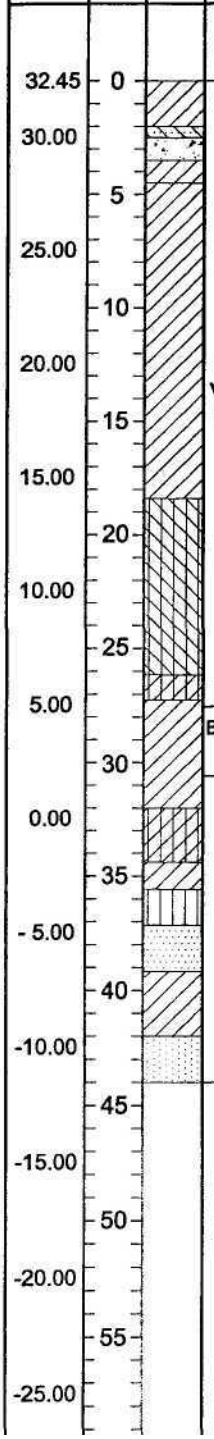
DRILLING COMPANY CCI DRILLING METHOD Hollow Stem Auger

GEOLOGIST Samuel Cheek DATE DRILLED 5/21/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 32.45

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
2.0	Clay (CH), red-brown, damp, firm, plastic, iron nodules
1.2	Sandy Clay (CL), red-brown, damp, firm, plastic, calcareous nodules
	Crushed concrete, gray
2.0	
2.0	
2.0	Clay (CH), brown, damp, stiff, common rootlets
2.0	- 3.5 - 4.0 concrete debris
2.0	- 7.1 - 7.2 sand seam (vf), gray and tan, wet
2.0	- 8.0 iron nodules (<1/10 to 1/4" diameter)
2.0	
2.0	
2.0	Silty Clay (CL), red-brown, damp, firm, plastic, calcareous nodules
2.0	- 24.8 gray, tan, red-brown, common calcareous nodules
2.0	- 25.3 - 26.1 increasing silt content
2.0	
2.0	Clayey Silt (ML), gray, tan, red-brown, wet, soft, calcareous nodules
2.0	Clay (CH), red-brown, damp, very stiff, very minor silt content
2.0	
2.0	Clayey Silt (ML), red-brown, wet, soft, slightly cohesive
2.0	Clay (CH), red-brown, damp, stiff
2.0	Silt (ML), red-brown, saturated, soft, well-sorted
2.0	Sand (SW), very fine-grained, red-brown, saturated, flowing
2.0	Clay (CH), red-brown, moist, very stiff, DNAPL present
0.5	Sand (SW), very fine-grained, red-brown, saturated, flowing, well-sorted

002151

WELL NUMBER: B 05 PZ

PROJECT: Piezometers LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 42.65 BOREHOLE DIA. (in) 6 STICKUP (ft) 2.35

CASING DIA. (in) 1 TYPE: Stainless Steel SCREEN LENGTH (ft) 10.0 SLOT SIZE (in) 0.010

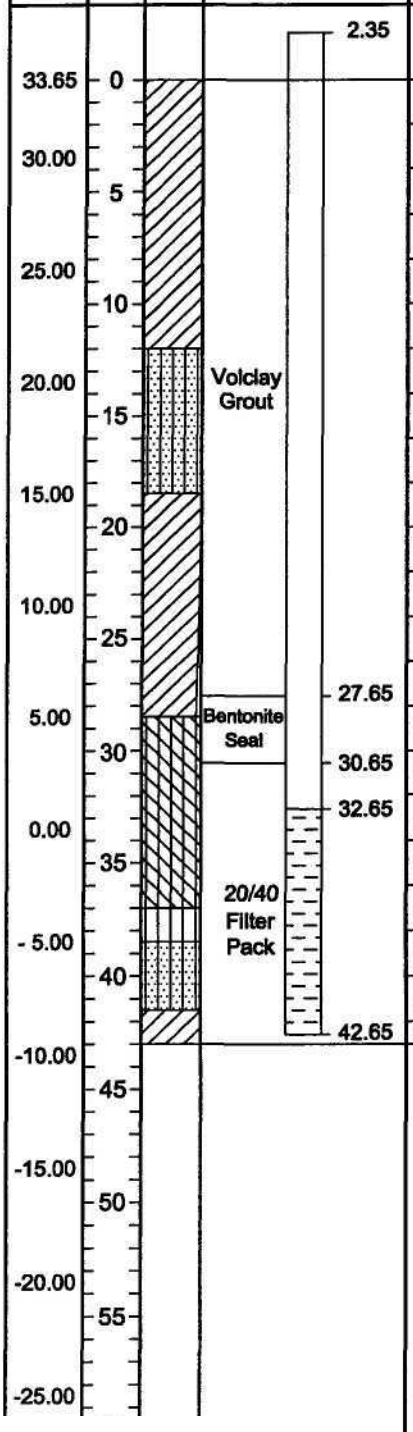
DRILLING COMPANY CCI DRILLING METHOD Hollow Stem Auger

GEOLOGIST Scott Ude DATE DRILLED 5/20/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 33.65

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



ELEVATION (Ft-MSL)	DEPTH (Ft)	SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
33.65	0	1.5	Clay (CH), dark brown, tan, and red-brown, dry to damp, firm
		1.6	- 5.5' former vegetation surface
30.00	5	1.5	- 5.5 - 8.0' dark brown, damp, soft to firm, common rootlets
		1.7	- 8.0 - 10.5 gray and tan, high plasticity
25.00	10	1.9	- 10.5 - 12.0 red-brown and gray, high plasticity
		2.0	
20.00	15	2.0	Silty Sand (SM) to Sand (SW), very fine-grained, red-brown and tan, wet to saturated
		2.0	- 12.0 - 12.5 sandy clay to clayey sand, red-brown and gray, damp, soft
		1.0	- 14.0' saturated, flowing
15.00	20	2.0	Clay (CH), red-brown with minor gray mottling
		2.0	- 20.5 - 26.0' gray and tan clay
10.00	25	2.0	- 22.0 - 24.0' common calcareous nodules
		2.0	- 26.0' - 28.5' red-brown
5.00	30	1.8	
		2.0	Silty Clay (CL), red-brown and gray, damp, minor DNAPL in pore spaces at 29.5'
0.00	35	2.0	
		2.0	
- 5.00	40	2.0	Silt (ML), red-brown, wet to saturated, slightly cohesive
		2.0	Silty Sand (SM), tan, saturated, DNAPL present
-10.00	45	2.0	
		1.0	Clay (CH), red-brown, damp, very stiff
-15.00	50		
-20.00	55		
-25.00			

002152

BORING LOG - WELL NUMBER: B01DW

PROJECT	BRIO-NORTH DNAPL WELL INSTALLATION	LOCATION	NORTH COVER - COMPARTMENT B		
TOTAL WELL DEPTH (Ft. BGS)	56.54	BOREHOLE DIA. (in)	12	STICKUP (ft)	4.54
CASING DIA. (IN)	4	TYPE Stainless Steel	SCREEN LENGTH (ft.)	10.0	SLOT SIZE (ft.) 0.010
DRILLING COMPAN	CCI	DRILLING METHOD	Hollow Stem Auger		
LOGGER	Walid Abou-Elias	DATE DRILLED	6/10/2002		
TOP OF CASING ELEVATION (Ft-MSL)		GROUND SURFACE ELEVATION (Ft-MSL)	33.46		

Boring was not logged, drilling activities were performed in level B

Boring hole was terminated at 57.0 Ft.-BGS

BORING LOG - WELL NUMBER: B02DW

PROJECT	BRIO-NORTH DNAPL WELL INSTALLATION	LOCATION	NORTH COVER - COMPARTMENT B
TOTAL WELL DEPTH (Ft. BGS)	52.51	BOREHOLE DIA. (in)	12
STICKUP (ft)	4.01		
CASING DIA. (IN)	4	TYPE	Stainless Steel
SCREEN LENGTH (ft.)	10.0	SLOT SIZE (ft.)	0.010
DRILLING COMPAN	CCI	DRILLING METHOD	Hollow Stem Auger
LOGGER	Walid Abou-Elias	DATE DRILLED	6/10/2002
TOP OF CASING ELEVATION (Ft-MSL)		GROUND SURFACE ELEVATION (Ft-MSL)	33.99

Boring was not logged, drilling activities were performed in level B

Boring hole was terminated at 53.0 Ft.-BGS

BORING LOG - WELL NUMBER: B03DW

PROJECT	BRIO-NORTH DNAPL WELL INSTALLATION	LOCATION	NORTH COVER - COMPARTMENT B
TOTAL WELL DEPTH (Ft. BGS)	57.312	BOREHOLE DIA. (in)	12
STICKUP (ft)	4.31		
CASING DIA. (IN)	4	TYPE	Stainless Steel
SCREEN LENGTH (ft.)	10.0	SLOT SIZE (ft.)	0.010
DRILLING COMPAN	CCI	DRILLING METHOD	Hollow Stem Auger
LOGGER	Walid Abou-Elias	DATE DRILLED	6/4/2002
TOP OF CASING ELEVATION (Ft-MSL)		GROUND SURFACE ELEVATION (Ft-MSL)	34.19

Boring was not logged, drilling activities were performed in level B

Boring hole was terminated at 57.5 Ft.-BGS

BORING LOG - WELL NUMBER: B04DW

PROJECT	BRIO-NORTH DNAPL WELL INSTALLATION	LOCATION	NORTH COVER - COMPARTMENT B
TOTAL WELL DEPTH (Ft. BGS)	54.98	BOREHOLE DIA. (in)	12
STICKUP (ft)	3.98		
CASING DIA. (IN)	4	TYPE	Stainless Steel
SCREEN LENGTH (ft.)	10.0	SLOT SIZE (ft.)	0.010
DRILLING COMPAN	CCI	DRILLING METHOD	Hollow Stem Auger
LOGGER	Walid Abou-Elias	DATE DRILLED	6/5/2002
TOP OF CASING ELEVATION (Ft-MSL)		GROUND SURFACE ELEVATION (Ft-MSL)	34.52

Boring was not logged, drilling activities were performed in level B

Boring hole was terminated at 55.5 Ft.-BGS

BORING LOG - WELL NUMBER: B05DW

PROJECT	BRIO-NORTH DNAPL WELL INSTALLATION	LOCATION	NORTH COVER - COMPARTMENT B		
TOTAL WELL DEPTH (Ft. BGS)	56.94	BOREHOLE DIA. (in)	12	STICKUP (ft)	3.94
CASING DIA. (IN)	4	TYPE	Stainless Steel	SCREEN LENGTH (ft.)	10.0
SLOT SIZE (ft.)	0.010				
DRILLING COMPAN	CCI	DRILLING METHOD	Hollow Stem Auger		
LOGGER	Walid Abou-Elias	DATE DRILLED	6/5/2002		
TOP OF CASING ELEVATION (Ft-MSL)		GROUND SURFACE ELEVATION (Ft-MSL)	34.56		

Boring was not logged, drilling activities were performed in level B

Boring hole was terminated at 57.5 Ft.-BGS

BORING LOG - WELL NUMBER: B06DW

PROJECT	BRIO-NORTH DNAPL WELL INSTALLATION	LOCATION	NORTH COVER - COMPARTMENT B		
TOTAL WELL DEPTH (Ft. BGS)	57.57	BOREHOLE DIA. (in)	12	STICKUP (ft)	3.57
CASING DIA. (IN)	4	TYPE Stainless Steel	SCREEN LENGTH (ft.)	10.0	SLOT SIZE (ft.) 0.010
DRILLING COMPAN	CCI	DRILLING METHOD	Hollow Stem Auger		
LOGGER	Walid Abou-Elias	DATE DRILLED	6/4/2002		
TOP OF CASING ELEVATION (Ft-MSL)		GROUND SURFACE ELEVATION (Ft-MSL)	35.43		

Boring was not logged, drilling activities were performed in level B

Boring hole was terminated at 58.0 Ft.-BGS

BORING LOG - WELL NUMBER: B07DW

PROJECT	BRIO-NORTH DNAPL WELL INSTALLATION	LOCATION	NORTH COVER - COMPARTMENT B		
TOTAL WELL DEPTH (Ft. BGS)	58.5	BOREHOLE DIA. (in)	12	STICKUP (ft)	3.50
CASING DIA. (IN)	4	TYPE	Stainless Steel	SCREEN LENGTH (ft.)	10.0
SLOT SIZE (ft.)	0.010				
DRILLING COMPAN	CCI	DRILLING METHOD	Hollow Stem Auger		
LOGGER	Walid Abou-Elias	DATE DRILLED	5/23/2002		
TOP OF CASING ELEVATION (Ft-MSL)		GROUND SURFACE ELEVATION (Ft-MSL)	35.50		

Boring was not logged, drilling activities were performed in level B

Boring hole was terminated at 59.0 Ft.-BGS

BORING LOG - WELL NUMBER: B08DW

PROJECT	BRIO-NORTH DNAPL WELL INSTALLATION	LOCATION	NORTH COVER - COMPARTMENT B		
TOTAL WELL DEPTH (Ft. BGS)	59.33	BOREHOLE DIA. (in)	12	STICKUP (ft)	3.83
CASING DIA. (IN)	4	TYPE	Stainless Steel	SCREEN LENGTH (ft.)	10.0
SLOT SIZE (ft.)	0.010				
DRILLING COMPAN	CCI	DRILLING METHOD	Hollow Stem Auger		
LOGGER	Walid Abou-Elias	DATE DRILLED	5/24/2003		
TOP OF CASING ELEVATION (Ft-MSL)		GROUND SURFACE ELEVATION (Ft-MSL)	35.17		

Boring was not logged, drilling activities were performed in level B

Boring hole was terminated at 59.5 Ft.-BGS

BORING LOG - WELL NUMBER: B09DW

PROJECT	BRIO-NORTH DNAPL WELL INSTALLATION	LOCATION	NORTH COVER - COMPARTMENT B
TOTAL WELL DEPTH (Ft. BGS)	57.4	BOREHOLE DIA. (in)	12
STICKUP (ft)	4.40		
CASING DIA. (IN)	4	TYPE	Stainless Steel
SCREEN LENGTH (ft.)	10.0	SLOT SIZE (ft.)	0.010
DRILLING COMPAN	CCI	DRILLING METHOD	Hollow Stem Auger
LOGGER	Walid Abou-Elias	DATE DRILLED	5/28/2002
TOP OF CASING ELEVATION (Ft-MSL)		GROUND SURFACE ELEVATION (Ft-MSL)	34.60

Boring was not logged, drilling activities were performed in level B

Boring hole was terminated at 58.0 Ft.-BGS

BORING LOG - WELL NUMBER: B10DW

PROJECT	BRIO-NORTH DNAPL WELL INSTALLATION	LOCATION	NORTH COVER - COMPARTMENT B
TOTAL WELL DEPTH (Ft. BGS)	57.00	BOREHOLE DIA. (in)	12
STICKUP (ft)	4.00		
CASING DIA. (IN)	4	TYPE	Stainless Steel
SCREEN LENGTH (ft.)	10.0	SLOT SIZE (ft.)	0.010
DRILLING COMPAN	CCI	DRILLING METHOD	Hollow Stem Auger
LOGGER	Walid Abou-Elias	DATE DRILLED	5/30/2002
TOP OF CASING ELEVATION (Ft-MSL)		GROUND SURFACE ELEVATION (Ft-MSL)	35.00

Boring was not logged, drilling activities were performed in level B

Boring hole was terminated at 57.0 Ft.-BGS

BORING LOG - WELL NUMBER: B11DW

PROJECT	BRIO-NORTH DNAPL WELL INSTALLATION	LOCATION	NORTH COVER - COMPARTMENT B
TOTAL WELL DEPTH (Ft. BGS)	55.50	BOREHOLE DIA. (in)	12
STICKUP (ft)	5.00		
CASING DIA. (IN)	4	TYPE	Stainless Steel
SCREEN LENGTH (ft.)	10.0	SLOT SIZE (ft.)	0.010
DRILLING COMPAN	CCI	DRILLING METHOD	Hollow Stem Auger
LOGGER	Walid Abou-Elias	DATE DRILLED	6/3/2002
TOP OF CASING ELEVATION (Ft-MSL)		GROUND SURFACE ELEVATION (Ft-MSL)	35.00

Boring was not logged, drilling activities were performed in level B

Boring hole was terminated at 56.0 Ft.-BGS

BORING LOG - WELL NUMBER: B12DW

PROJECT	BRIO-NORTH DNAPL WELL INSTALLATION	LOCATION	NORTH COVER - COMPARTMENT B		
TOTAL WELL DEPTH (Ft. BGS)	56.35	BOREHOLE DIA. (in)	12	STICKUP (ft)	4.35
CASING DIA. (IN)	4	TYPE	Stainless Steel	SCREEN LENGTH (ft.)	10.0
SLOT SIZE (ft.)	0.010				
DRILLING COMPAN	CCI	DRILLING METHOD	Hollow Stem Auger		
LOGGER	Walid Abou-Elias	DATE DRILLED	5/21/2002		
TOP OF CASING ELEVATION (Ft-MSL)		GROUND SURFACE ELEVATION (Ft-MSL)	34.15		

Boring was not logged, drilling activities were performed in level B

Boring hole was terminated at 56.5 Ft.-BGS

BORING LOG - WELL NUMBER: B13DW

PROJECT	BRIO-NORTH DNAPL WELL INSTALLATION	LOCATION	NORTH COVER - COMPARTMENT B
TOTAL WELL DEPTH (Ft. BGS)	55.30	BOREHOLE DIA. (in)	12
STICKUP (ft)	4.30		
CASING DIA. (IN)	4	TYPE	Stainless Steel
SCREEN LENGTH (ft.)	10.0	SLOT SIZE (ft.)	0.010
DRILLING COMPAN	CCI	DRILLING METHOD	Hollow Stem Auger
LOGGER	Walid Abou-Elias	DATE DRILLED	5/22/2002
TOP OF CASING ELEVATION (Ft-MSL)		GROUND SURFACE ELEVATION (Ft-MSL)	34.20

Boring was not logged, drilling activities were performed in level B

Boring hole was terminated at 55.5 Ft.-BGS

Sh. 1 of 1

WELL NUMBER: C 01 GW

PROJECT: GW Recovery Wells LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 45.55 BOREHOLE DIA. (in) 12 STICKUP (ft) 6.45

CASING DIA. (in) 4 TYPE: Stainless Steel SCREEN LENGTH (ft) 15.0 SLOT SIZE (in) 0.010

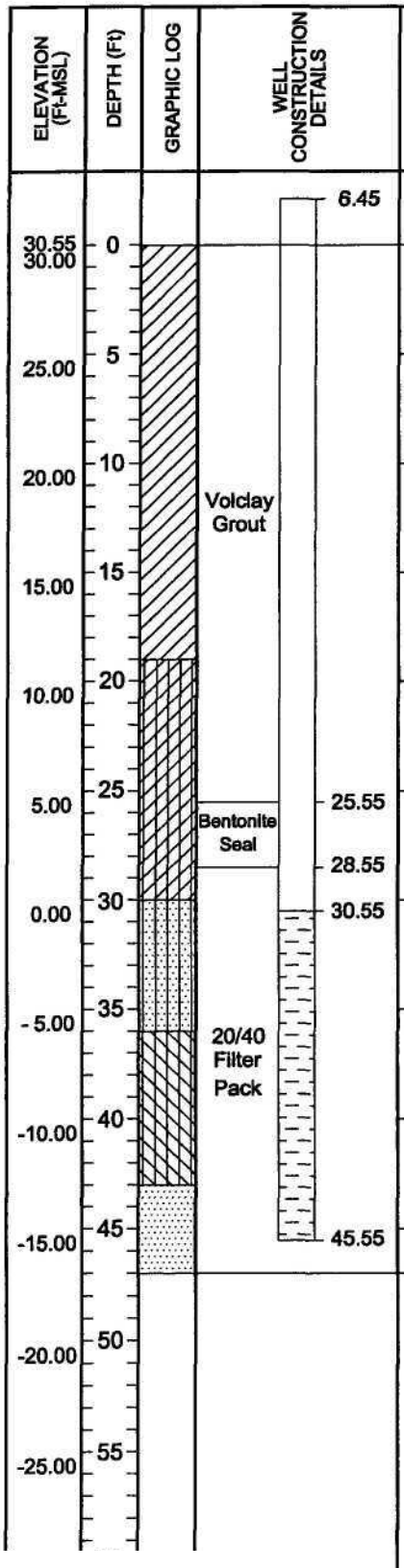
DRILLING COMPANY Fugro DRILLING METHOD Hollow Stem Auger

GEOLOGIST Scott Ude DATE DRILLED 6/11/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 30.55

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
5.0	Clay (CH), red-brown, dark gray and gray, damp, firm - 4.6' former vegetation surface - 4.5 - 9.2' dark gray - 9.5 - 12.0' gray - 12.0 - 19.0' red-brown and gray, high plasticity
5.0	
5.0	
5.0	
5.0	Clayey Silt (ML) to Silty Clay (CL), gray and tan, wet, soft to firm, cohesive - 20' saturated below 20' in silt-rich zones - 20.0 - 43.5' red-brown color - 24.0 - 25.5' clay, red-brown, damp, very stiff
5.0	
2.5	Silty Sand (SM), very fine-grained, red-brown, saturated, slightly cohesive to flowing
5.0	Silt to Clayey Silt (ML), red-brown, saturated, cohesive to flowing - 37.5 - 38.0' clay, red-brown, very stiff - 43.0 - 43.5' clay, red-brown, very stiff
4.0	
2.0	Sand (SW), very fine-grained, red brown to tan, saturated, flowing -45.0 - 45.9' clay, red-brown, very stiff

002166

WELL NUMBER: C 02 GW

PROJECT: GW Recovery Wells LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 51.74 BOREHOLE DIA. (in) 12 STICKUP (ft) 5.01

CASING DIA. (in) 4 TYPE: Stainless Steel SCREEN LENGTH (ft) 15.0 SLOT SIZE (in) 0.010

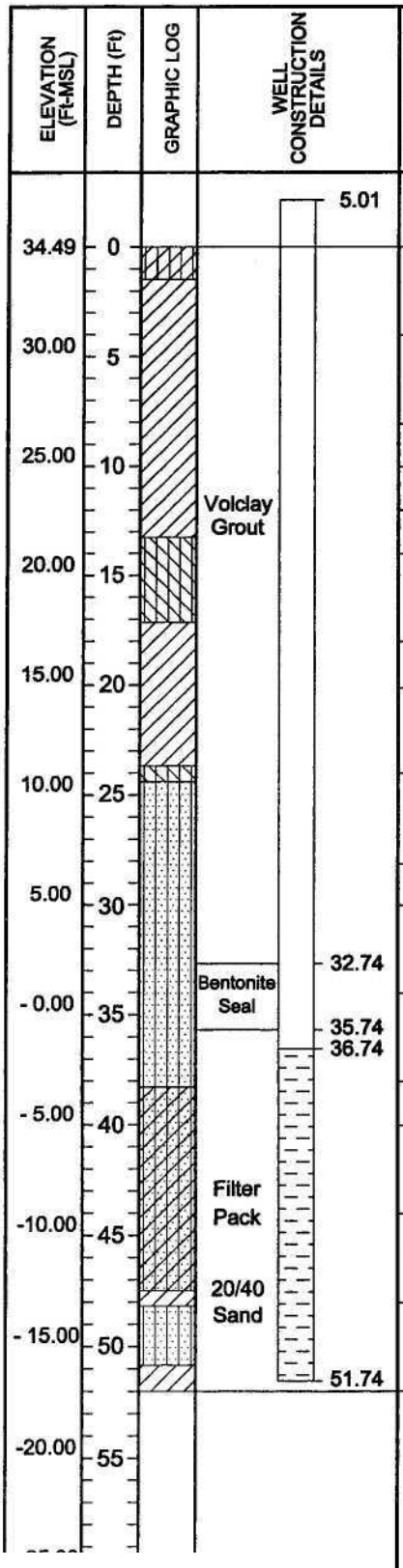
DRILLING COMPANY CCI DRILLING METHOD Hollow Stem Auger

GEOLOGIST Samuel Cheek DATE DRILLED 6/11/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 34.49

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
2.0	Clayey Silt (ML), tan-brown, wet, very cohesive
3.5	Clay (CH), tan-brown, damp, firm, plastic, common rootlets, minor calcareous and iron nodules - 6.0 - 13.2 dark brown
2.0	
2.0	
2.0	
4.0	Silty Clay (CL), tan, red-brown, damp, stiff, plastic - 14.1 - 14.2 tar-like material
2.0	Clay (CH), red-brown, damp, stiff, plastic
4.0	
4.0	Silty Clay (CL), red-brown to gray, damp, firm, plastic
2.0	Sandy Silt (ML), red-brown to gray, wet, moderately cohesive, very minor clay content - 30.1 - 30.3' increase in clay content - 36.1 - 38.2' minor DNAPL
4.0	
4.0	
2.0	Clayey Silty Sand (SM), very fine-grained, red-brown, saturated, cohesive, soft -38.2 - 47.5' DNAPL common throughout sand
4.0	
4.0	
4.0	Clay (CH), red-brown, dry, very stiff
	Silty Sand (SM), very fine-grained, red-brown, saturated, slightly cohesive
	Clay (CH), red-brown, damp, very stiff

002167

WELL NUMBER: C 03 GW

PROJECT: GW Recovery Wells LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 48.71 BOREHOLE DIA. (in) 12 STICKUP (ft) 4.79

CASING DIA. (in) 4 TYPE: Stainless Steel SCREEN LENGTH (ft) 15.0 SLOT SIZE (in) 0.010

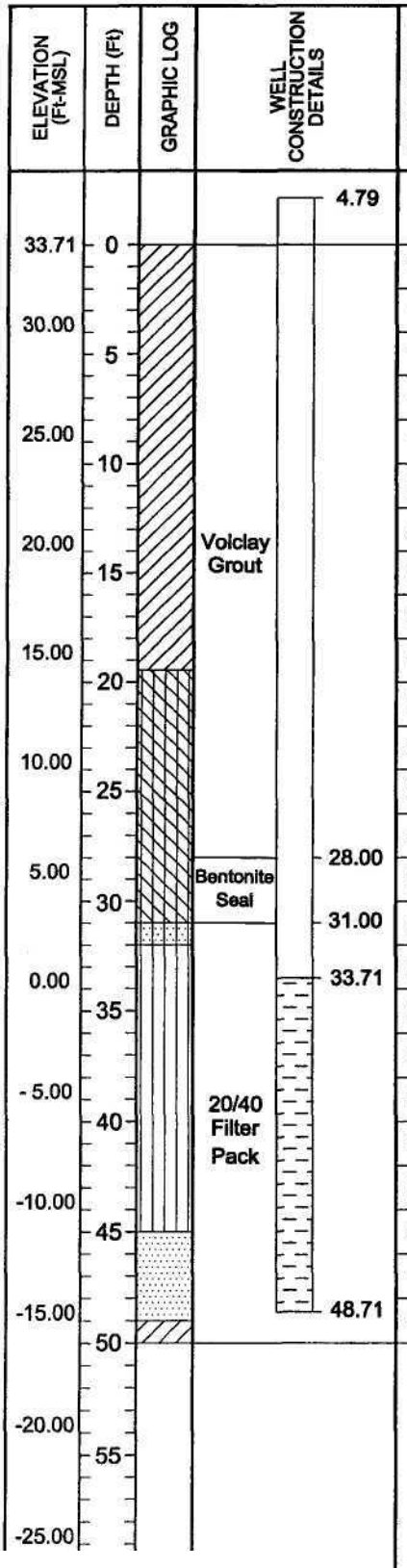
DRILLING COMPANY CCI DRILLING METHOD Hollow Stem Auger

GEOLOGIST Scott Ude DATE DRILLED 6/11/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 33.71

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



LITHOLOGIC DESCRIPTION

Clay (CH), dark brown, tan, red-brown and gray, damp, firm

- 0 - 2' minor concrete clasts
- 4 - 8' minor clasts (<2 cm diam) black charcoal-like, shiny brittle material
- 8 - 15' gray and tan, high plasticity
- 11.5' calcareous nodule-rich zone to 11.7'
- 15 - 19.5' red-brown and gray, minor calcareous nodules, minor pockets of dark brown natural organic matter (<1 cm diam), high plasticity

Silty Clay (CL) to Clayey Silt (ML), gray and tan, moist to wet, soft

- 22 - 50' red-brown
- 24' saturated, minor calcareous nodules
- 26.5 - 28' clay, red-brown, damp, very stiff, high plasticity

Silty Sand (SM), very fine-grained, red-brown and gray, saturated, slightly cohesive

Silt (ML), red-brown, saturated, slightly cohesive

- 38 - 39.5' clay to silty clay
- 44 - 45' clay, red-brown, very stiff

Sand (SW), very fine-grained, red-brown to tan, saturated, flowing

- 47 - 47.2' gray clay, very stiff

Clay (CH), red-brown, damp, very stiff

002168

WELL NUMBER: C 04 GW

PROJECT: GW Recovery Wells LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 44.51 BOREHOLE DIA. (in) 12 STICKUP (ft) 6.99

CASING DIA. (in) 4 TYPE: Stainless Steel SCREEN LENGTH (ft) 15.0 SLOT SIZE (in) 0.010

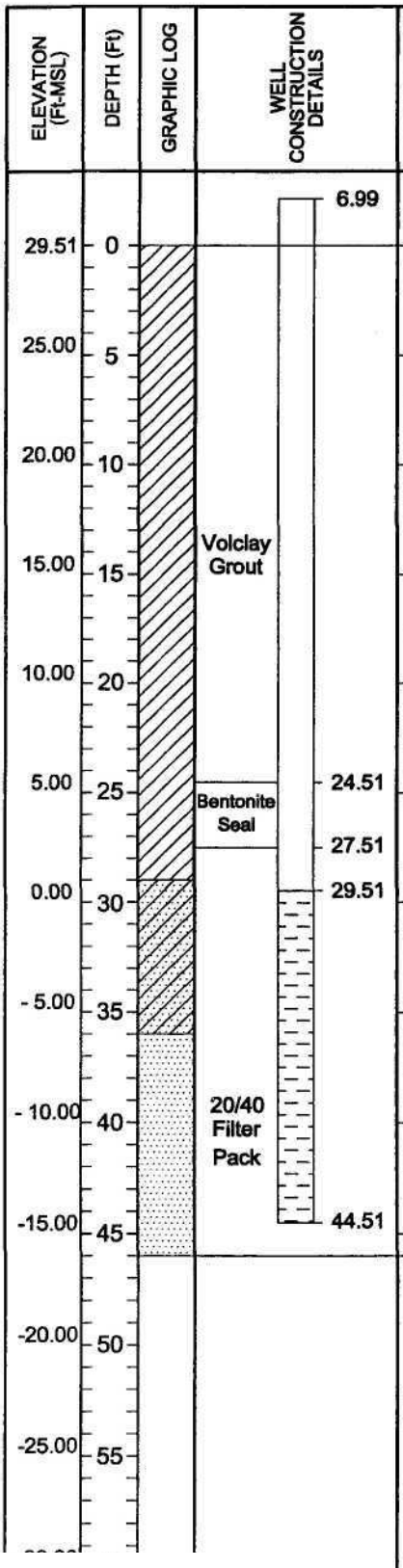
DRILLING COMPANY Fugro DRILLING METHOD Hollow Stem Auger

GEOLOGIST Scott Ude DATE DRILLED 6/06/02

TOP OF CASING ELEVATION (Ft-MSL) _____ GROUND SURFACE ELEVATION (Ft-MSL) 29.51

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
4.0	Clay (CH), dark gray, gray and red-brown, damp, firm - 0 - 4' intermixed colors - 4 - 11' gray and tan, very minor pockets of natural organic matter (< 1 cm diam.) - 11 - 17' red-brown, high plasticity - 17 - 20' tan and gray, slightly silty - 21 - 22' clayey silt, saturated, soft, - 20 - 36' red-brown with minor gray
5.0	
5.0	
5.0	
5.0	
5.0	Clayey Silt (ML), red-brown, saturated, soft
2.5	Sand (SW), very fine-grained, tan, saturated, flowing
5.0	
1.0	

002169

C05 GW

WELL INSTALLATION LOG
NOT AVAILABLE

WELL NUMBER: C 01 PZ

PROJECT: Piezometers LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 46.75 BOREHOLE DIA. (in) 8 STICKUP (ft) 2.75

CASING DIA. (in) 1.0 TYPE: Stainless Steel SCREEN LENGTH (ft) 10.0 SLOT SIZE (in) 0.010

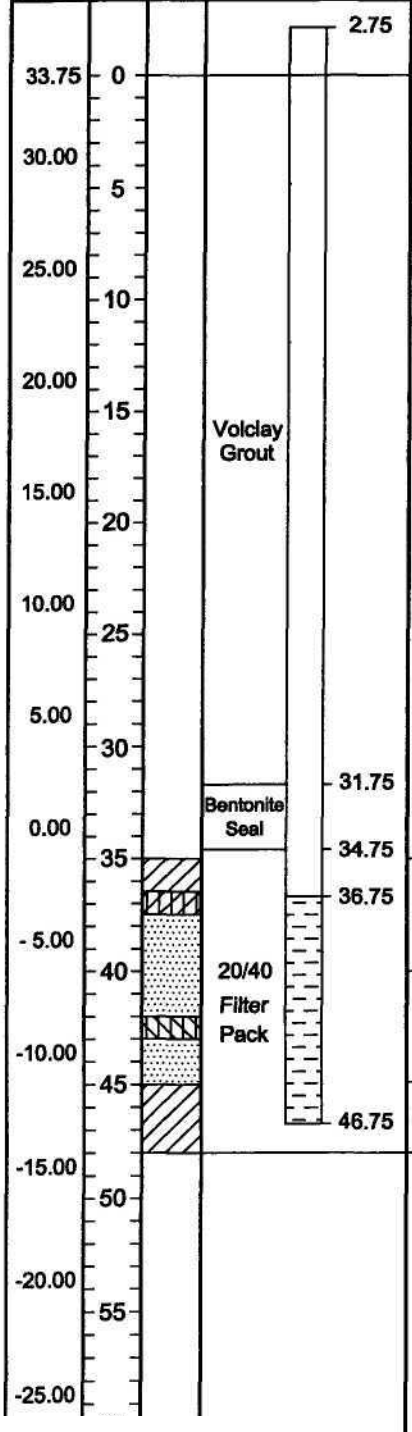
DRILLING COMPANY Fugro DRILLING METHOD Hollow Stem Auger

GEOLOGIST Scott Ude DATE DRILLED 5/22/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 33.75

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



SOIL SAMPLE RECOVERY (FL)	LITHOLOGIC DESCRIPTION
	- 0 - 35.0' bgs (below ground surface) drilled without sampling
NA	
4.5	Clay (CH), red-brown, damp, very stiff Clayey Silt (ML), saturated, cohesive, soft Sand (SW), very fine-grained, tan, saturated, flowing
3.5	Silty Clay (CL), red-brown, wet, firm Sand (SW), very fine-grained, tan, saturated, minor DNAPL pockets
2.5	Clay (CH) to Silty Clay (CL), red-brown, wet to saturated - 46.0' 1 - inch sand seam with DNAPL

002171

Sh. 1 of 1

WELL NUMBER: C 02 PZ

PROJECT: Piezometers LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 49.40 BOREHOLE DIA. (in) 6 STICKUP (ft) 3.10

CASING DIA. (in) 1 TYPE: Stainless Steel SCREEN LENGTH (ft) 10.0 SLOT SIZE (in) 0.010

DRILLING COMPANY CCI DRILLING METHOD Hollow Stem Auger

GEOLOGIST Scott Ude DATE DRILLED 5/21/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 34.40

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION

ELEVATION (Ft-MSL)	DEPTH (Ft)	WELL CONSTRUCTION DETAILS	SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
		3.10		
34.40	0		1.5	Sandy Clay (CL), red-brown, dry
			1.5	
30.00	5		1.5	Clay (CH) to Silty Clay (CL), dark brown and tan, minor red-brown, damp, very stiff
			1.5	- 6 - 8' common rootlets, minor fine calcareous nodules
25.00	10		2.0	- 8 - 12' dark gray to gray, minor iron nodules < 2 mm diam, minor NAPL staining, soft to firm
			2.0	
			2.0	Clay (CH), gray, damp, very stiff.
20.00	15	Volclay Grout	2.0	- 14' becomes red-brown and gray, very stiff at 14 - 14.5' silty clay
			2.0	- 24 - 26' sandy clay, gray and red-brown, wet, firm
15.00	20		2.0	- 26' saturated on outside of core
			2.0	- 30 - 33' silty clay, saturated, soft to firm
10.00	25		2.0	
			2.0	
			2.0	
5.00	30		2.0	
			2.0	
0.00	35	Bentonite Seal	34.40 2.0	Clayey Silt (ML), red-brown, wet, slightly cohesive
			37.40 1.5	- 35 - 36' clay, red-brown, damp, stiff
- 5.00	40		39.40 2.0	
		20/40 Filter Pack	2.0	
			2.0	Silty Sand (SM), very fine-grained, to Clayey Silty Sand, red-brown and gray, saturated, flowing to slightly cohesive
-10.00	45		2.0	Sand (SW), very fine-grained, tan, saturated, flowing.
			2.0	Clay (CH), red-brown, damp, very stiff
-15.00	50		49.40 2.0	- 45.6' 1/2" sd, very fine-grained seam - 49 - 50' clayey silt
-20.00	55			

002172

Sh. 1 of 1

WELL NUMBER: C 03 PZ

PROJECT: Piezometers LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 50.00 BOREHOLE DIA. (in) 8 STICKUP (ft) 2.50

CASING DIA. (in) 1 TYPE: Stainless Steel SCREEN LENGTH (ft) 10.0 SLOT SIZE (in) 0.010

DRILLING COMPANY Fugro DRILLING METHOD Hollow Stem Auger

GEOLOGIST Scott Ude DATE DRILLED 5/22/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 34.50

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION

ELEVATION (Ft-MSL)	DEPTH (Ft)	GRAPHIC LOG	WELL CONSTRUCTION DETAILS	SOIL SAMPLE RECOVERY (Ft.)	LITHOLOGIC DESCRIPTION
34.50	0		2.50		
					- 0 - 35.0' bgs (below ground surface) drilled without sampling
30.00	5				
25.00	10				
20.00	15		Volclay Grout	NA	
15.00	20				
10.00	25				
5.00	30				
0.00	35		Bentonite Seal 35.00		
				3.0	Clayey Silt (ML) to Silty Clay (CL), red-brown and minor gray, saturated, soft.
			38.00		- 39.0 - 40.0 clay, red-brown, damp, very stiff
- 5.00	40		20/40 Filter Pack 40.00	2.5	
-10.00	45			2.5	Sand (SW), very fine-grained, red-brown, saturated, flowing
-15.00	50		50.00	2.0	Clay (CH), red-brown, damp, very stiff
-20.00	55				

002173

WELL NUMBER: C 04 PZ

PROJECT: Piezometers LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 47.28 BOREHOLE DIA. (in) 8 STICKUP (ft) 3.97

CASING DIA. (in) 1.0 TYPE: Stainless Steel SCREEN LENGTH (ft) 10' SLOT SIZE (in) 0.010

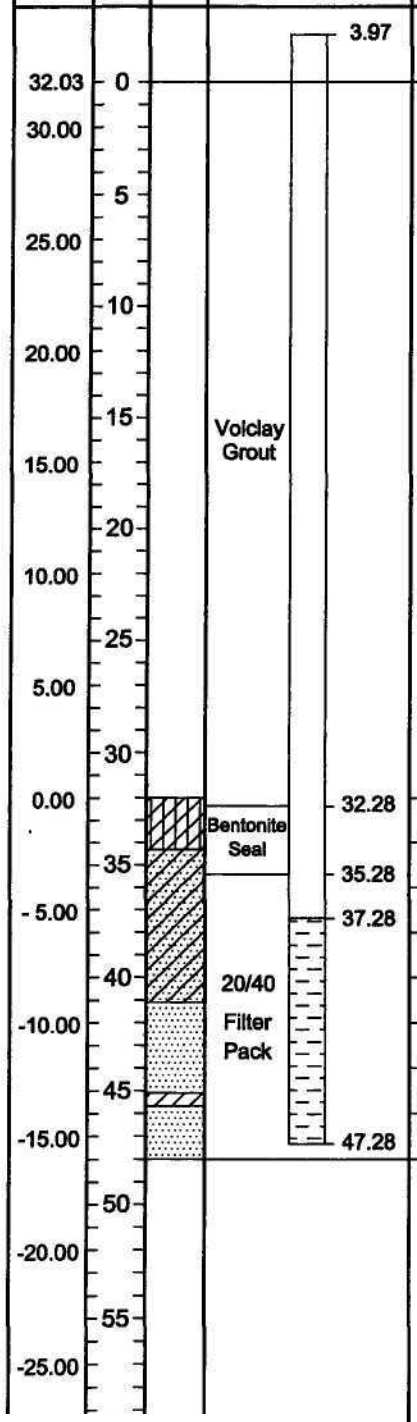
DRILLING COMPANY CCI DRILLING METHOD Hollow Stem Auger

GEOLOGIST Samuel Cheek DATE DRILLED 5/24/02

TOP OF CASING ELEVATION (Ft-MSL) _____ GROUND SURFACE ELEVATION (Ft-MSL) 32.03

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



SOIL SAMPLE RECOVERY (FL)	LITHOLOGIC DESCRIPTION
	- 0 - 32.0' bgs (below ground surface) drilled without sampling
NA	
2.0	Clayey Silt (ML), red-brown, moist, soft, slightly cohesive, minor sand
2.0	Clayey Sand (SC), red-brown, wet, soft, slightly cohesive
2.0	- 35.8 - 35.9 clay seam
2.0	
2.0	
0.0	Sand (SW), very fine-grained, red-brown, saturated, soft, slightly cohesive, very minor clay content
2.0	Clay (CH), red-brown, moist, firm, minor sand
2.0	Sand (vf) (SW), red-brown, saturated, soft - 47.5 - 47.8 sandy clay, red brown, moist, firm

002174

Sh. 1 of 1

WELL NUMBER: C 05 PZ

PROJECT: Piezometers LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 45.73 BOREHOLE DIA. (in) 8 STICKUP (ft) 3.77

CASING DIA. (in) 1 TYPE: Stainless Steel SCREEN LENGTH (ft) 10.0 SLOT SIZE (in) 0.010

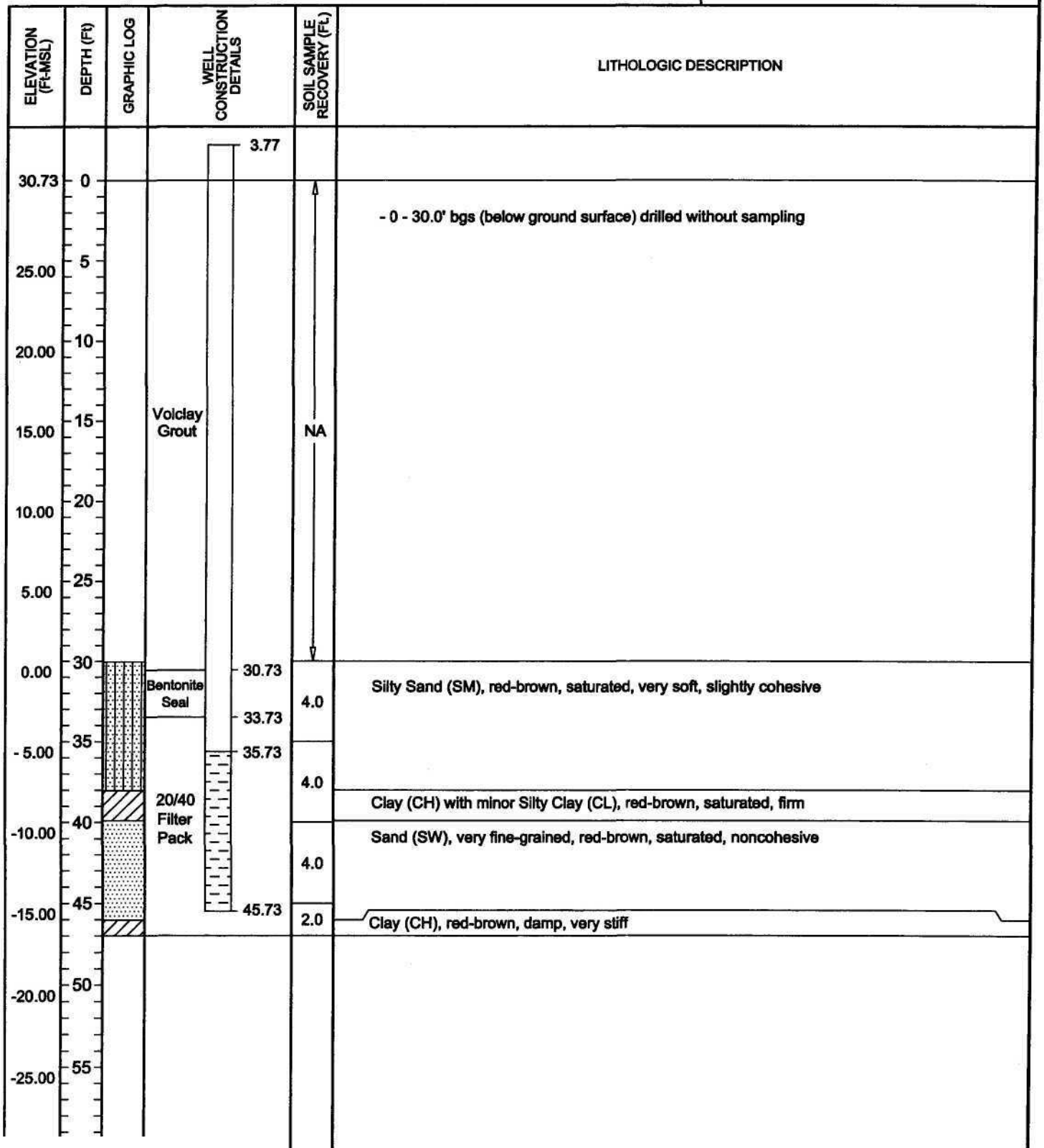
DRILLING COMPANY Fugro DRILLING METHOD Hollow Stem Auger

GEOLOGIST Scott Ude DATE DRILLED 5/24/02

TOP OF CASING ELEVATION (Ft-MSL) _____ GROUND SURFACE ELEVATION (Ft-MSL) 30.73

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



002175

Sh. 1 of 1

WELL NUMBER: C 06 PZ

PROJECT: Piezometers LOCATION: Brio North Site

TOTAL WELL DEPTH (Ft. BGS) 43.40 BOREHOLE DIA. (in) 8 STICKUP (ft) 3.60

CASING DIA. (in) 1 TYPE: Stainless Steel SCREEN LENGTH (ft) 10.0 SLOT SIZE (in) 0.010

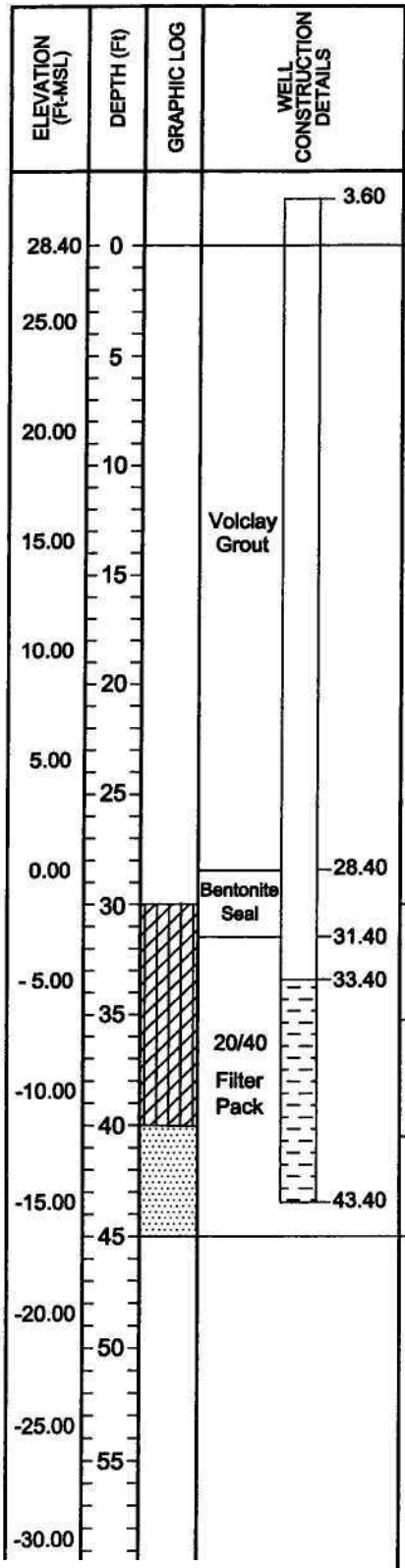
DRILLING COMPANY Fugro DRILLING METHOD Hollow Stem Auger

GEOLOGIST Scott Ude DATE DRILLED 5/23/02

TOP OF CASING ELEVATION (Ft-MSL) GROUND SURFACE ELEVATION (Ft-MSL) 28.40

LOCATION SKETCH/ADDITIONAL NOTES

GROUND SURFACE ELEVATION =
BEDDING LAYER ELEVATION
AT THE TIME OF CONSTRUCTION



LITHOLOGIC DESCRIPTION

- 0 - 30.0' bgs (below ground surface) drilled without sampling

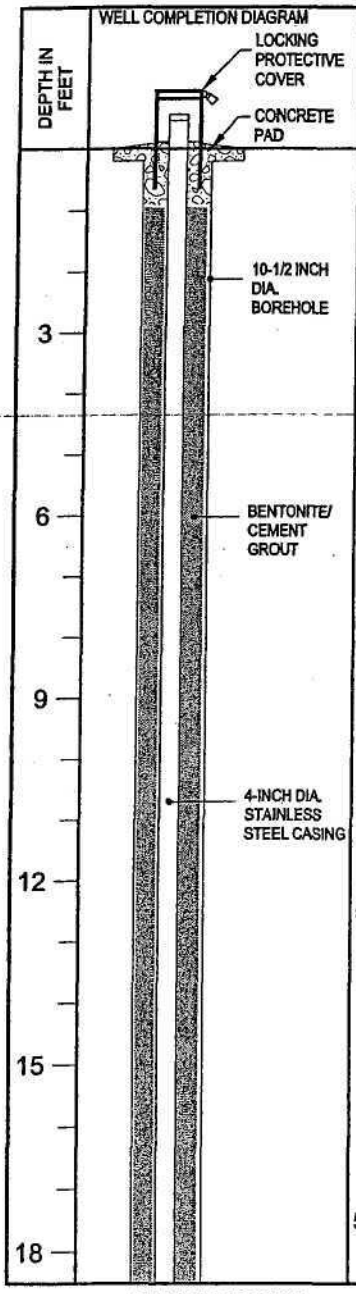
Clayey Silt (ML) with minor Silty Clay (CL), red-brown, silty zones are very soft and saturated

Sand (SW), very fine-grained, red-brown, saturated, flowing

002176

SOIL BORING/RECOVERY WELL: DO1GW

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/17/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: FUGRO
BOREHOLE DIA.: 10.5 inch MONITOR WELL DIA.: 4 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 650,758.74 E 3,207,903.21
RIG TYPE: TRUCK-MOUNTED CME 75 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 31.25'
ELEVATION (TOC): 36.83'
INITIAL GROUNDWATER DEPTH : 19.0 BGS
SURFACE CONDITION: BEDDING LAYER CLAY
PAGE: 1 OF 3



DEPTH IN FEET	SAMPLING METHOD	SAMPLING	FEET DRIVEN / FEET RECOVERED	SOIL GRAPH	LITHOLOGIC DESCRIPTION
0	5CS		5/5	CH	Dark gray CLAY (FILL)
3					Stiff, dark gray mottled gray CLAY (UPPER CLAY UNIT, UCU)
					- abundant dark mineral nodules 3' to 6'
6	5CS		5/5	CH	- some roots 6' to 8'
					- becomes stiff below 8'
9					Reddish brown at 9'
12	5CS		5/5		- abundant dark mineral nodules 12' to 13'
					- becomes very stiff below 13'
					- some calcareous nodules from 14' to 16'
15				CL	Soft, reddish brown silty CLAY
	5CS		5/5	SC	Soft, reddish brown mottled w/gray clayey SAND (NUMEROUS SAND CHANNELS ZONE, NSCZ)
18					- moist at 18'

SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
5CS	5-FOOT CONTINUOUS SAMPLER
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

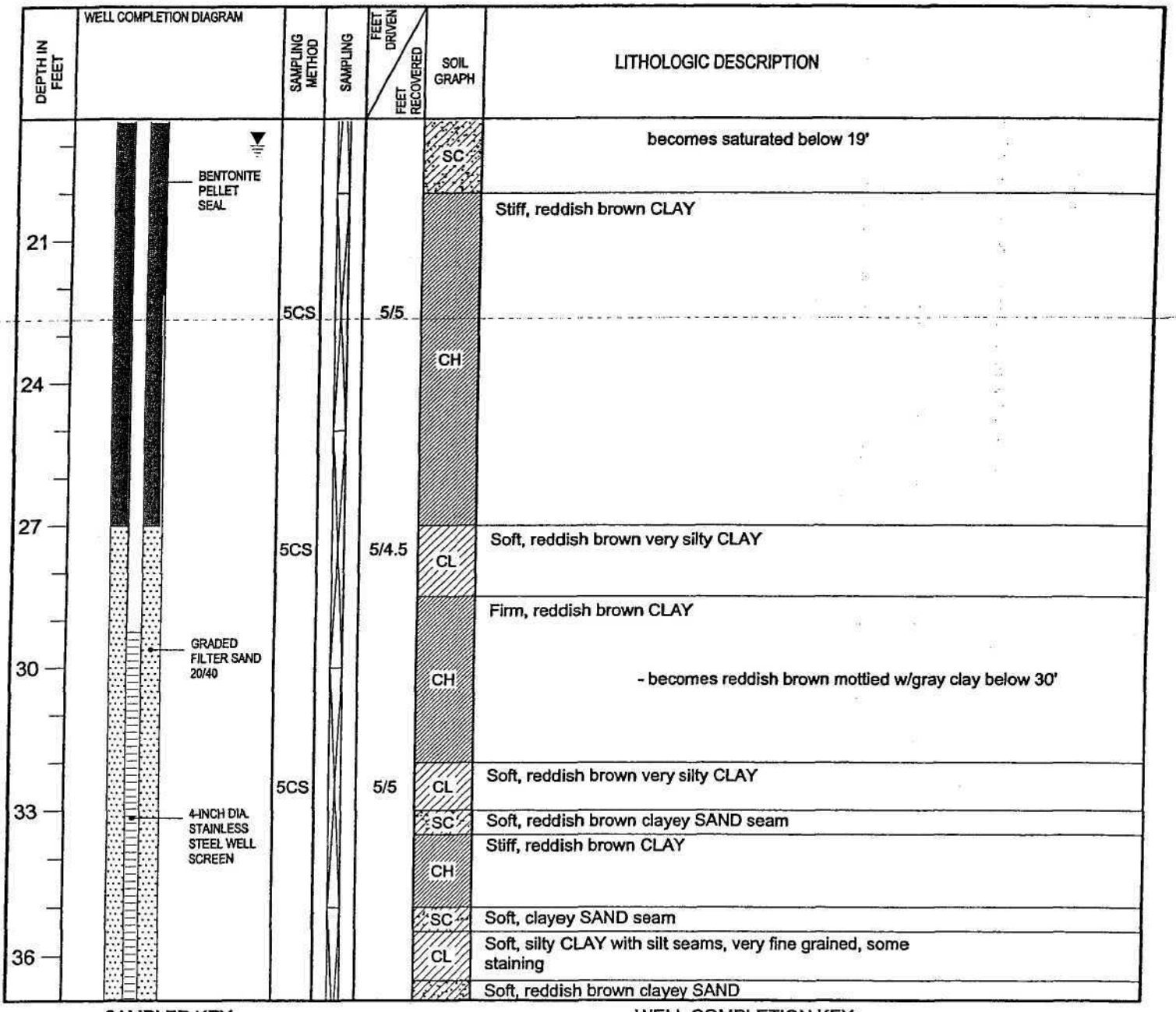
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/RECOVERY WELL: DO1GW (cont'd)

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/17/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: FUGRO
BOREHOLE DIA.: 10.5 inch MONITOR WELL DIA.: 4 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 650,758.74 E 3,207,903.21
RIG TYPE: TRUCK-MOUNTED CME 75 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 31.25'
ELEVATION (TOC): 36.83'
INITIAL GROUNDWATER DEPTH: 19.0 BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
5CS	5-FOOT CONTINUOUS SAMPLER
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

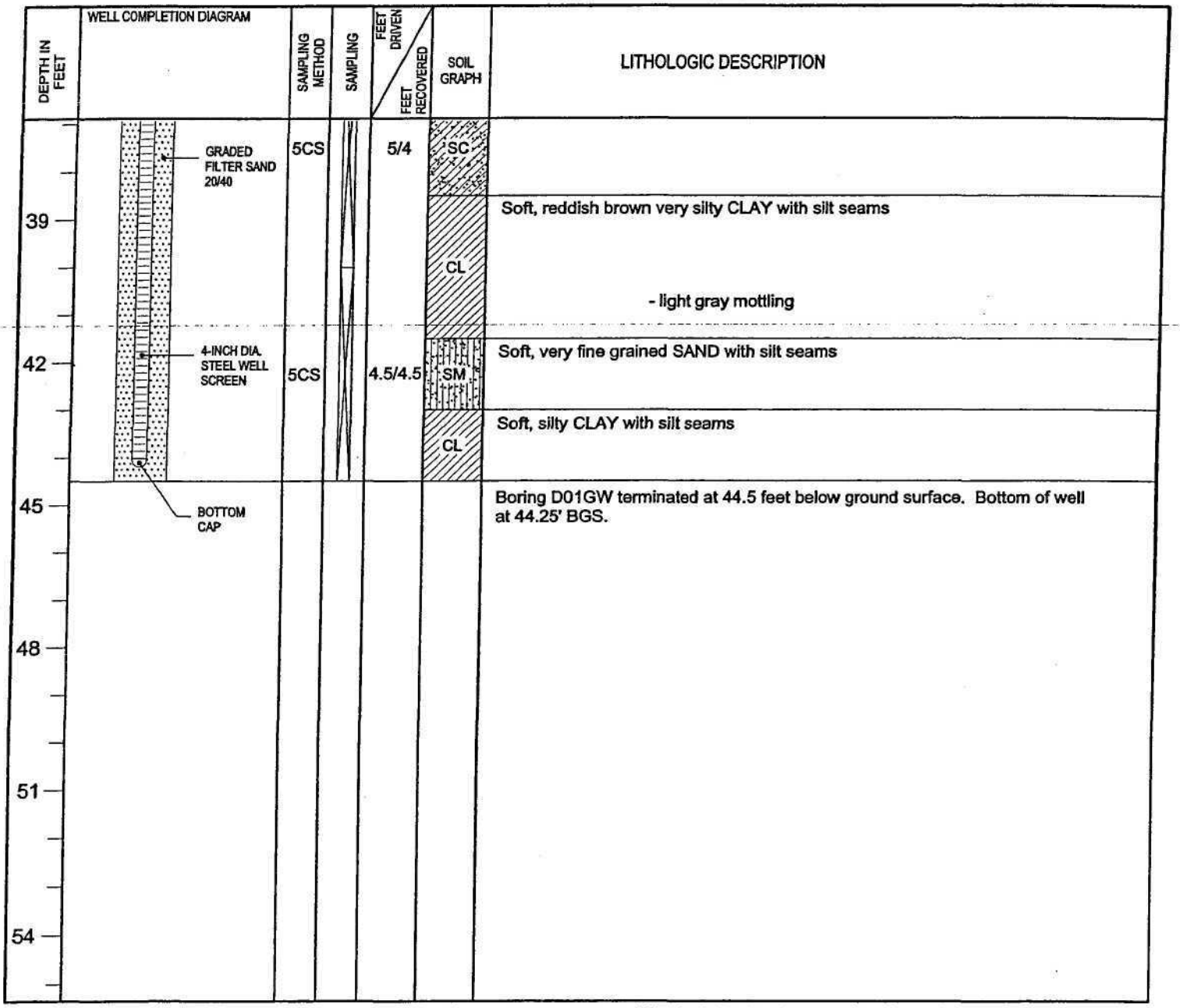
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/RECOVERY WELL: D01GW (cont'd)

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/17/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: FUGRO
BOREHOLE DIA.: 10.5 inch MONITOR WELL DIA.: 4 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 650,758.74 E 3,207,903.21
RIG TYPE: TRUCK-MOUNTED CME 75 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 31.25'
ELEVATION (TOC): 36.83'
INITIAL GROUNDWATER DEPTH: 19.0 BGS
SURFACE CONDITION: BEDDING LAYER CLAY
PAGE: 3 OF 3



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
5CS	5-FOOT CONTINUOUS SAMPLER
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

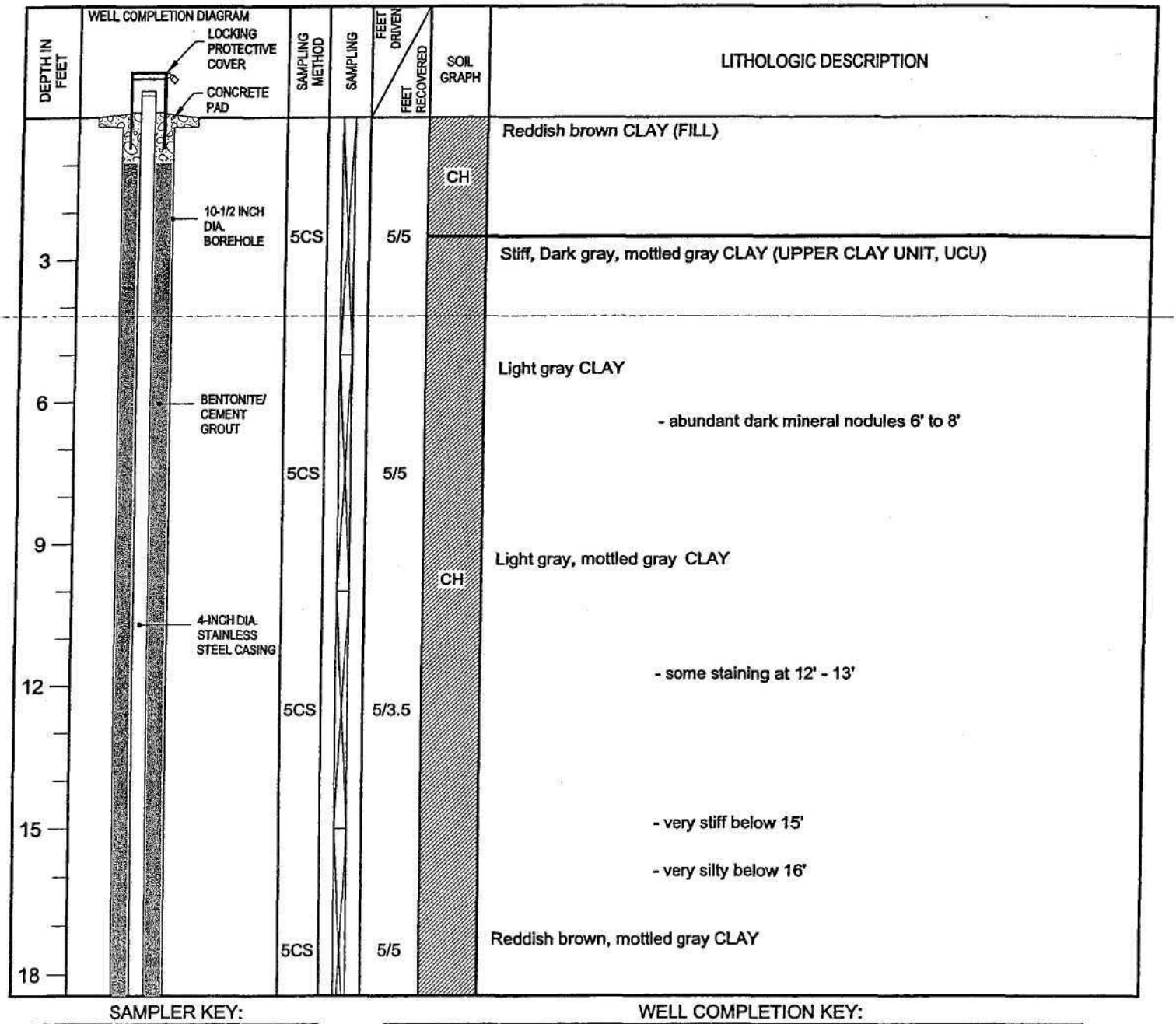
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/RECOVERY WELL: DO2GW

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/18-20/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: FUGRO
BOREHOLE DIA.: 10.5 inch MONITOR WELL DIA.: 4 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,084.3925 E 3,208,100.7687
RIG TYPE: TRUCK-MOUNTED CME 75 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 35.0'
ELEVATION (TOC): 40.40'
INITIAL GROUNDWATER DEPTH : 23.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY
PAGE: 1 OF 3



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
5CS	5-FOOT CONTINUOUS SAMPLER
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

WELL COMPLETION KEY:

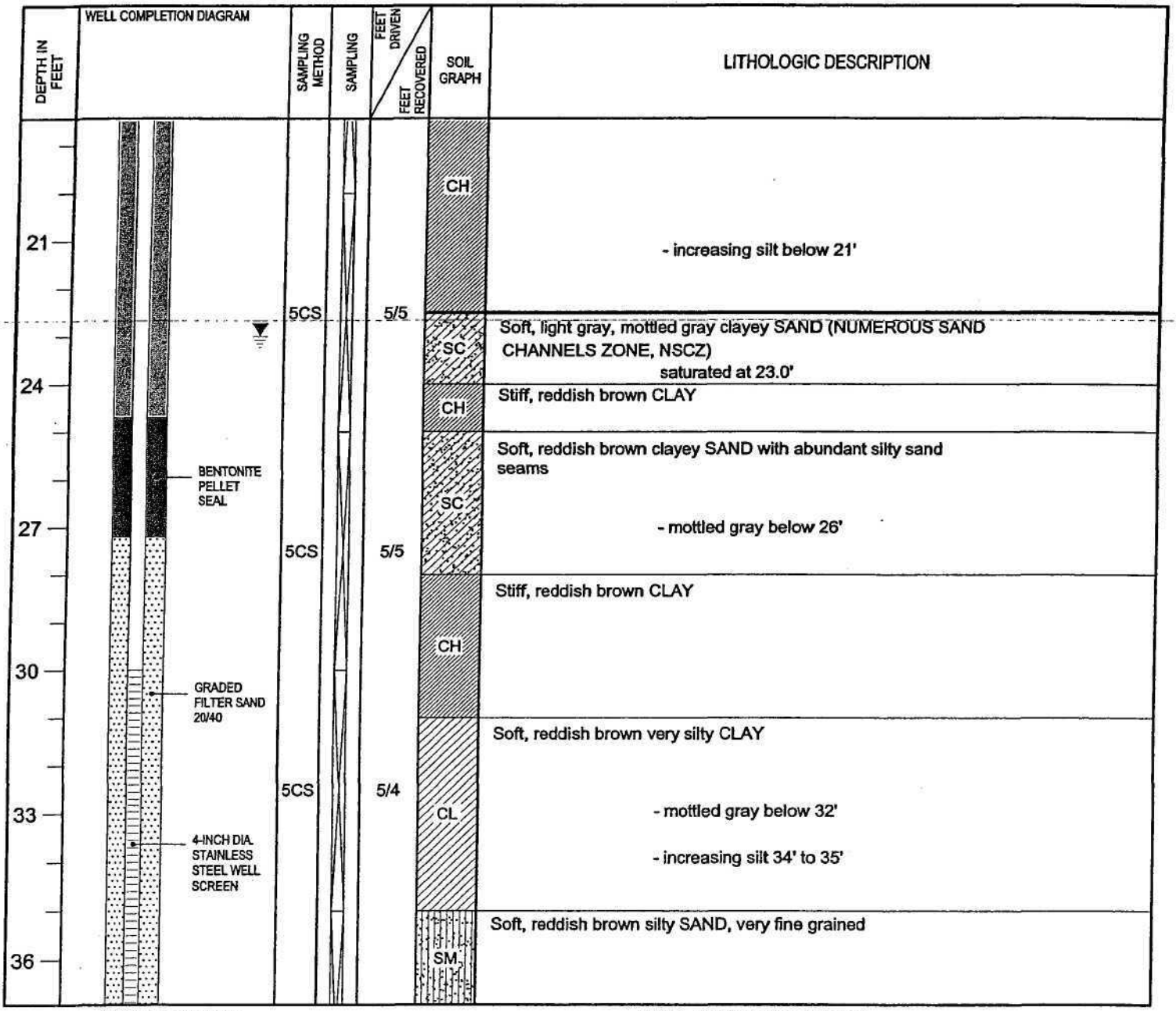
LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

002180

SOIL BORING/RECOVERY WELL: **DO2GW (cont'd)**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/18-20/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: FUGRO
BOREHOLE DIA.: 10.5 inch MONITOR WELL DIA.: 4 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,084.3925 E 3,208,100.7687
RIG TYPE: TRUCK-MOUNTED CME 75 ROTARY DRILL
BEDDING LAYER SURFACE ELEV. : 35.0'
ELEVATION (TOC): 40.40'
INITIAL GROUNDWATER DEPTH : 23.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
5CS	5-FOOT CONTINUOUS SAMPLER
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

WELL COMPLETION KEY:

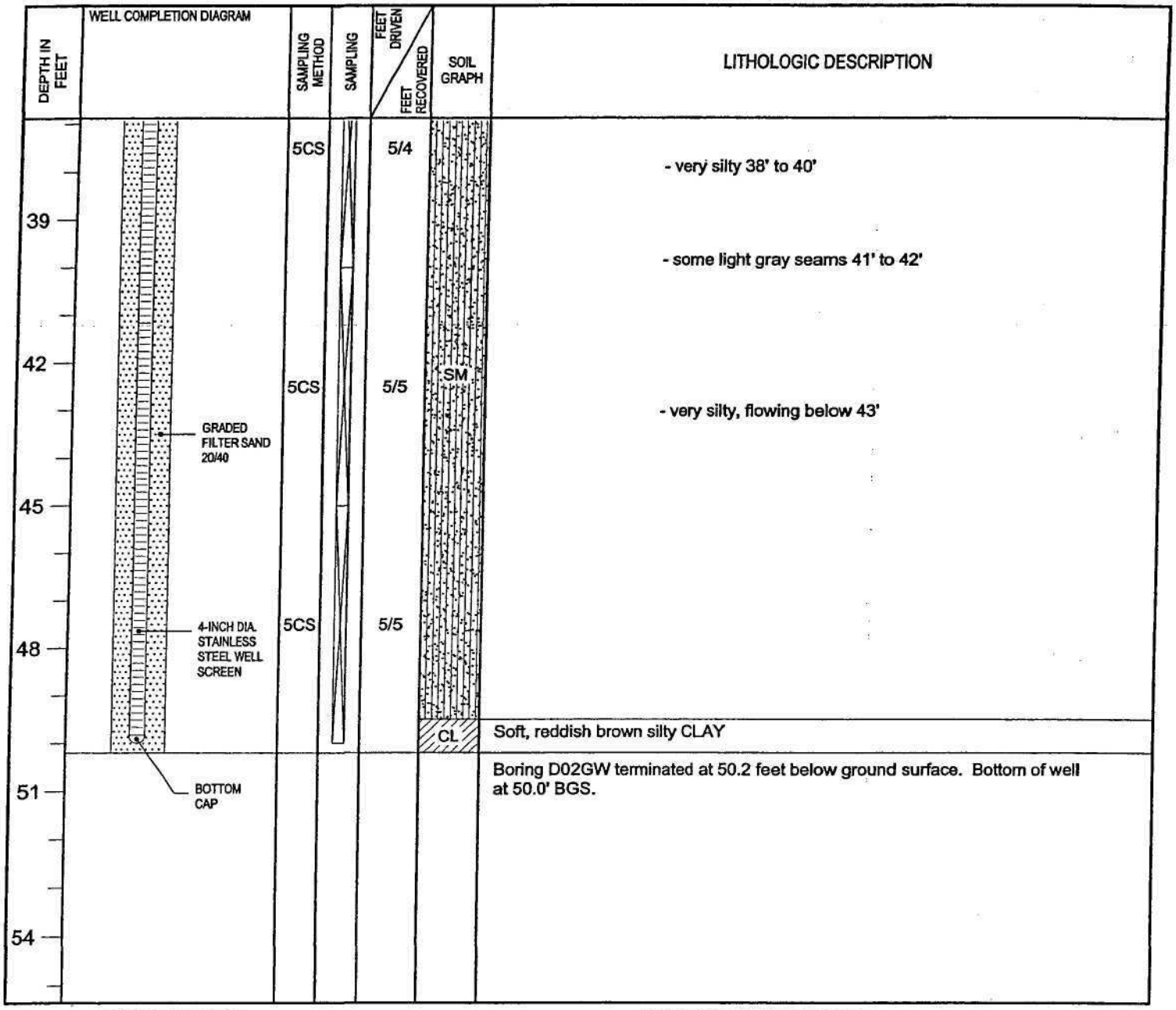
LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

002181

SOIL BORING/RECOVERY WELL: DO2GW (cont'd)

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/18-20/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: FUGRO
BOREHOLE DIA.: 10.5 inch MONITOR WELL DIA.: 4 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,084.3925 E 3,208,100.7687
RIG TYPE: TRUCK-MOUNTED CME 75 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 35.0'
ELEVATION (TOC): 40.40'
INITIAL GROUNDWATER DEPTH: 23.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
5CS	5-FOOT CONTINUOUS SAMPLER
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

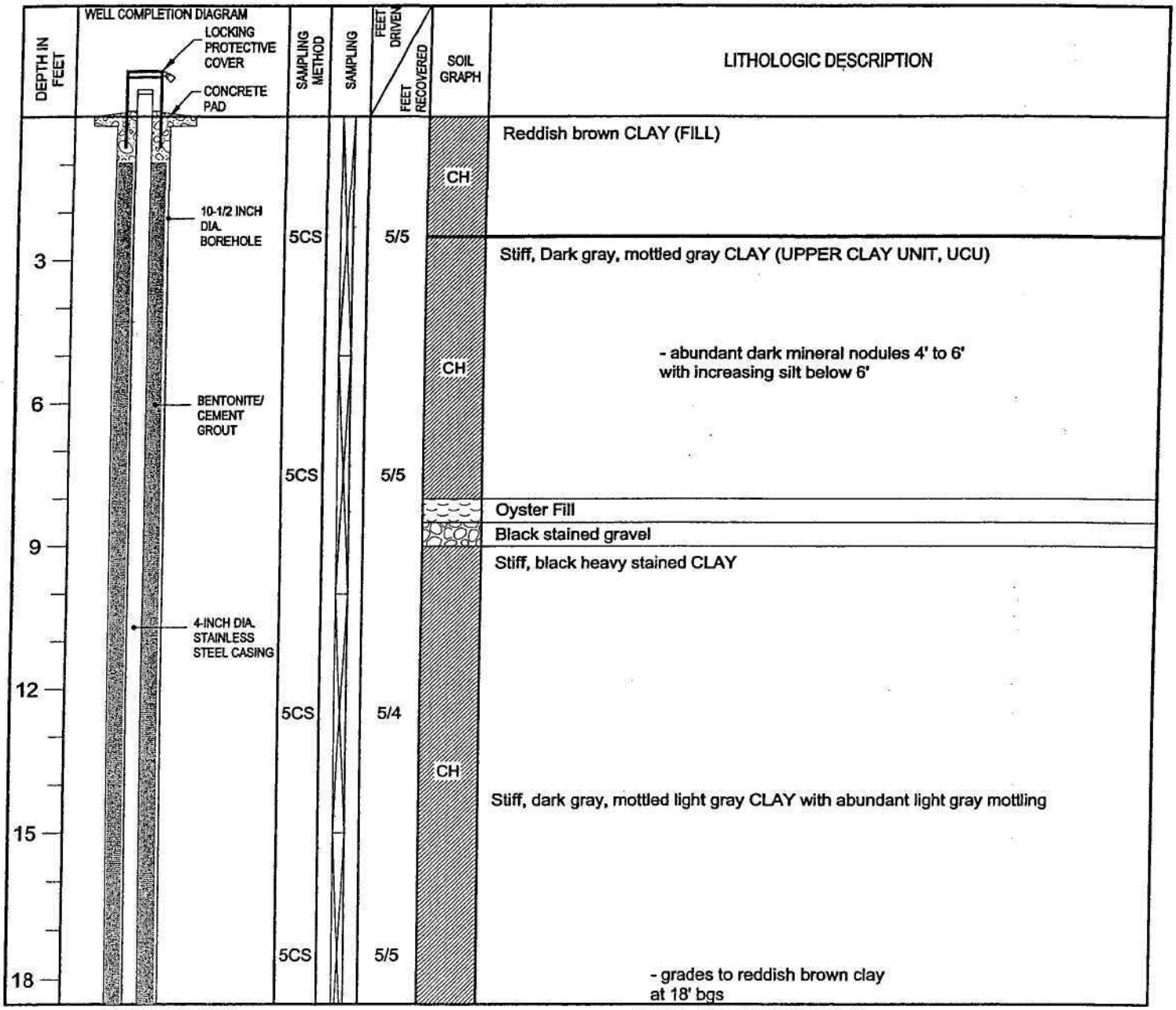
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/RECOVERY WELL: **DO3GW**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/18-19/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: FUGRO
BOREHOLE DIA.: 10.5 inch MONITOR WELL DIA.: 4 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,271.22 E 3,208,262.94
RIG TYPE: TRUCK-MOUNTED CME 75 ROTARY DRILL
BEDDING LAYER SURFACE ELEV. : 36.8'
ELEVATION (TOC): 41.16'
INITIAL GROUNDWATER DEPTH : 26.0 BGS
SURFACE CONDITION: BEDDING LAYER CLAY
PAGE: 1 OF 3



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
5CS	5-FOOT CONTINUOUS SAMPLER
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

WELL COMPLETION KEY:

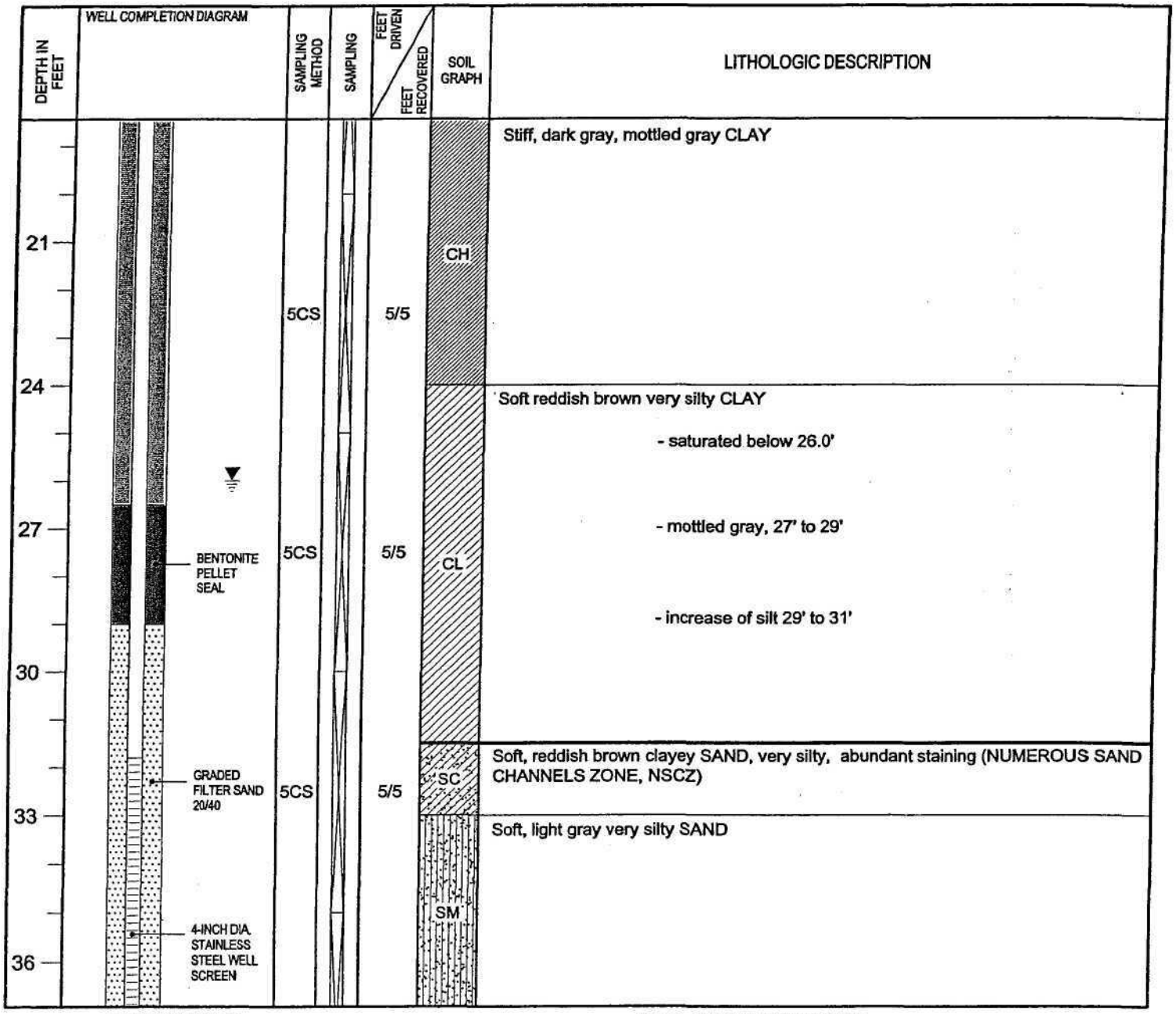
LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

002183

SOIL BORING/RECOVERY WELL: DO3GW (cont'd)

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/18-19/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: FUGRO
BOREHOLE DIA.: 10.5 inch MONITOR WELL DIA.: 4 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,271.22 E 3,208,262.94
RIG TYPE: TRUCK-MOUNTED CME 75 ROTARY DRILL
BEDDING LAYER SURFACE ELEV. : 36.8'
ELEVATION (TOC): 41.16'
INITIAL GROUNDWATER DEPTH : 26.0 BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
5CS	5-FOOT CONTINUOUS SAMPLER
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

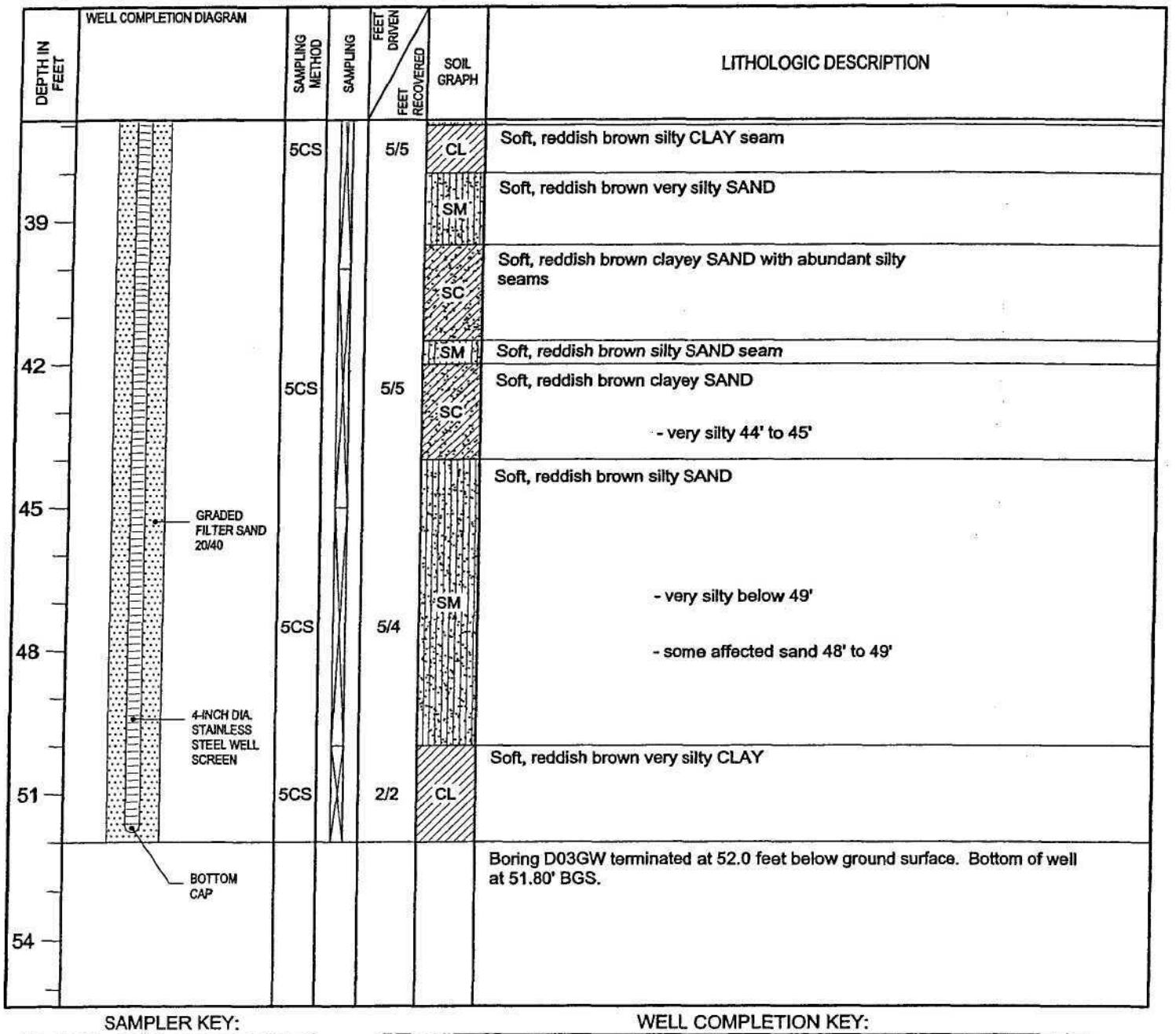
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/RECOVERY WELL: **D03GW (cont'd)**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/18-19/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: FUGRO
BOREHOLE DIA.: 10.5 inch MONITOR WELL DIA.: 4 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,271.22 E 3,208,262.94
RIG TYPE: TRUCK-MOUNTED CME 75 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 36.8'
ELEVATION (TOC): 41.16'
INITIAL GROUNDWATER DEPTH: 26.0 BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
5CS	5-FOOT CONTINUOUS SAMPLER
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

Project: Brio Monitored Natural Attenuation Study	LOG OF BORING & WELL CONSTRUCTION FOR P0-610
Project Location: Brio Superfund Site, Houston, Texas	Sheet 1 of 2
Project Number: 46-00000024.00	

Date(s) Drilled	8/7/00	Logged By	E. Page	Checked By	
Drilling Method	4-1/4 in. ID Hollow-Stem Augers	Borehole Diameter (in.)	8	Total Depth Drilled (ft BGL)	42.0
Drill Rig Type	Failing F-6	Drilling Contractor	CCI EnviroDrilling, Inc.	Ground Surface Elevation (ft MSL)	26.40
Water Encountered During Drilling (ft bgs)	21 ft	Static Water Level (ft bgs) and Date Measured		Top of Casing Elevation (ft MSL)	29.15
Comments	Boring was grouted to surface and monitoring well installed in adjacent boring.				

Elevation, feet	Depth, feet	Sampler Graphic	Type of Sampler	Recovery, (feet)	Samples Sent to Lab	Field Screening (ppmv)	Graphic Log	MATERIAL DESCRIPTION
	0	ST		1.1		0		Stiff, moist, brown high plasticity CLAY (CH), with organic matter, trace limonite nodules
		ST		1		0		becomes dark gray at 1 ft becomes yellowish-brown at 2 ft
	5	ST		2		0		
-20		ST		2		0		becomes reddish-brown with gray mottling
		ST		2		0		Stiff, moist, gray silty CLAY (CL)
		ST		2		0		becomes gray-brown, mottled
	10	ST		2		0		becomes firm, with little or no silt
		ST		2		0		becomes soft, very silty/sandy
		ST		2		0		Very stiff, moist, reddish-brown high plasticity CLAY (CH), with gray mottling
	15	ST		2		0		
-10		ST		2		0		
		ST		2		0		Medium dense, moist, reddish-brown clayey SILT (ML), with gray mottling, trace very fine sand
	20	ST		2		0		
		ST		2		0		becomes wet (21 ft) with 6 in. reddish-brown high plasticity clay seam
		ST		2		0		
	25	ST		2		0		
-0		ST		2		0		Very stiff, moist, reddish-brown high plasticity CLAY (CH), with gray and yellow streaking
		ST		2		0		
	30							

Well Construction Diagram

- Locking Cap
- Expansion Cap
- Protective Casing: 4 in. Steel
- Pad: 4 ft x 4 ft Concrete Pad
- Cement/bentonite grout
- 2-in. ID Schedule 40 PVC Riser Pipe
- 3/8-in. Baroid Holeplug Chips
- 20/40 Silica Sand
- 2-in. ID Schedule 40 PVC screen, 0.010 in. slots

BWC_1 BRIOMNA.GPJ WC_CORP1.GDT 11/2/00

URS Greiner Woodward Clyde

002186

Project: Brio Monitored Natural Attenuation Study
Project Location: Brio Superfund Site, Houston, Texas
Project Number: 46-00000024.00

LOG OF BORING & WELL CONSTRUCTION FOR P0-610

Elevation, feet	Depth, feet	SAMPLES: Sampler Graphic	SAMPLES: Type of Sampler	SAMPLES: Recovery, (feet)	SAMPLES: Samples Sent to Lab	Field Screening (ppmv)	Graphic Log	MATERIAL DESCRIPTION	Well Construction Diagram
	30	ST		2		0		SAME: Very stiff, moist, reddish-brown high plasticity CLAY (CH), with gray and yellow streaking	
		ST		2		0			
	35	ST		2		0		with thin silt partings	
-10		ST		2		0			
		ST		2		0			
	40	ST		2		0			
								BOB 42 ft.	
								Samples collected using 3 in. OD Shelby Tube.	
	45								
-20									
	50								
	55								
-30									
	60								
	65								

WC_1 BRIOMNA.GPJ WC_CORP1.GDT 11/2/00

URS Greiner Woodward Clyde

002187

Project: Brio Monitored Natural Attenuation Study **Project Location:** Brio Superfund Site, Houston, Texas **Project Number:** 46-00000024.00	**LOG OF BORING & WELL CONSTRUCTION FOR P0-613** Sheet 1 of 1

Date(s) Drilled	8/8/00	Logged By	E. Page	Checked By	
Drilling Method	4-1/4 in. ID Hollow-Stem Augers	Borehole Diameter (in.)	8	Total Depth Drilled (ft BGL)	27.0
Drill Rig Type	Failing F-6	Drilling Contractor	CCI EnviroDrilling, Inc.	Ground Surface Elevation (ft MSL)	27.60
Water Encountered During Drilling (ft bgs)		Static Water Level (ft bgs) and Date Measured		Top of Casing Elevation (ft MSL)	30.30
Comments	No samples collected during installation of P0-613. Well installed adjacent to P0-612.				

Elevation, feet	Depth, feet	SAMPLES: Sampler Graphic	SAMPLES: Type of Sampler	SAMPLES: Recovery, (feet)	SAMPLES: Samples Sent to Lab	Field Screening (ppmv)	Graphic Log	MATERIAL DESCRIPTION
	0							Stiff, moist, brown high plasticity CLAY (CH)
								becomes dark gray, with trace fine gravel
								with yellow mottling, limonite nodules
	5							becomes reddish-brown with gray mottling, trace gravel
20								
								with 2 in. silt seam
	10							Firm, moist, gray silty low plasticity CLAY (CL)
								becomes brown with trace gray mottling, trace fine sand
	15							with very thin seams of fine sand
10								Very stiff, moist, reddish-brown high plasticity CLAY (CH), with gray mottling, black partings
	20							Medium dense, moist, reddish-brown SILT (ML) with gray mottling, trace clay
								6 in. clay seam
								Medium dense, moist, reddish-brown silty fine SAND (SM) with thin (<2 in.) clay seams, trace gravel fragments
	25							becomes clayey
0								
	30							BOB 27 ft

Well Construction Diagram

- Locking Cap
- Expansion Cap
- Protective Casing: 4 in. Steel
- Pad: 4 ft x 4 ft Concrete Pad
- Cement/bentonite groute
- 2-in. ID Schedule 40 PVC Riser Pipe
- 3/8-in. Baroid Holeplug Chips
- 20/40 Silica Sand Filter Pack
- 2-in. ID Schedule 40 PVC Screen, 0.010 in. slots

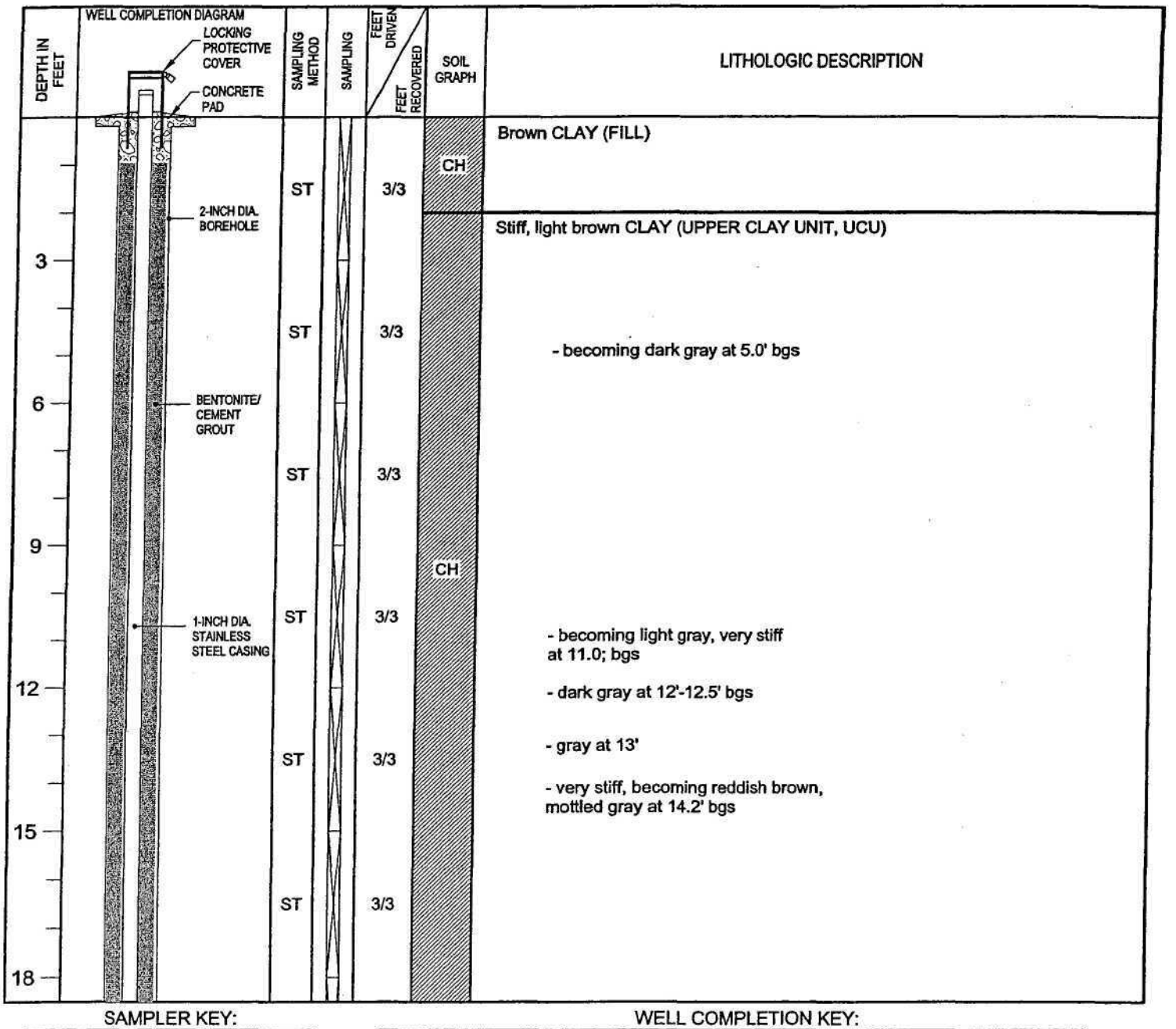
BWC_1 BRIOMNA.GPJ WC_CORP1.GDT 11/2/00

URS Greiner Woodward Clyde

002188

SOIL BORING/PIEZOMETER: **DO1PZ**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/16/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,070.5095 E 3,207,812.7553
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 33.0'
ELEVATION (TOC): 33.88'
INITIAL GROUNDWATER DEPTH : 22.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY
PAGE: 1 OF 3



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

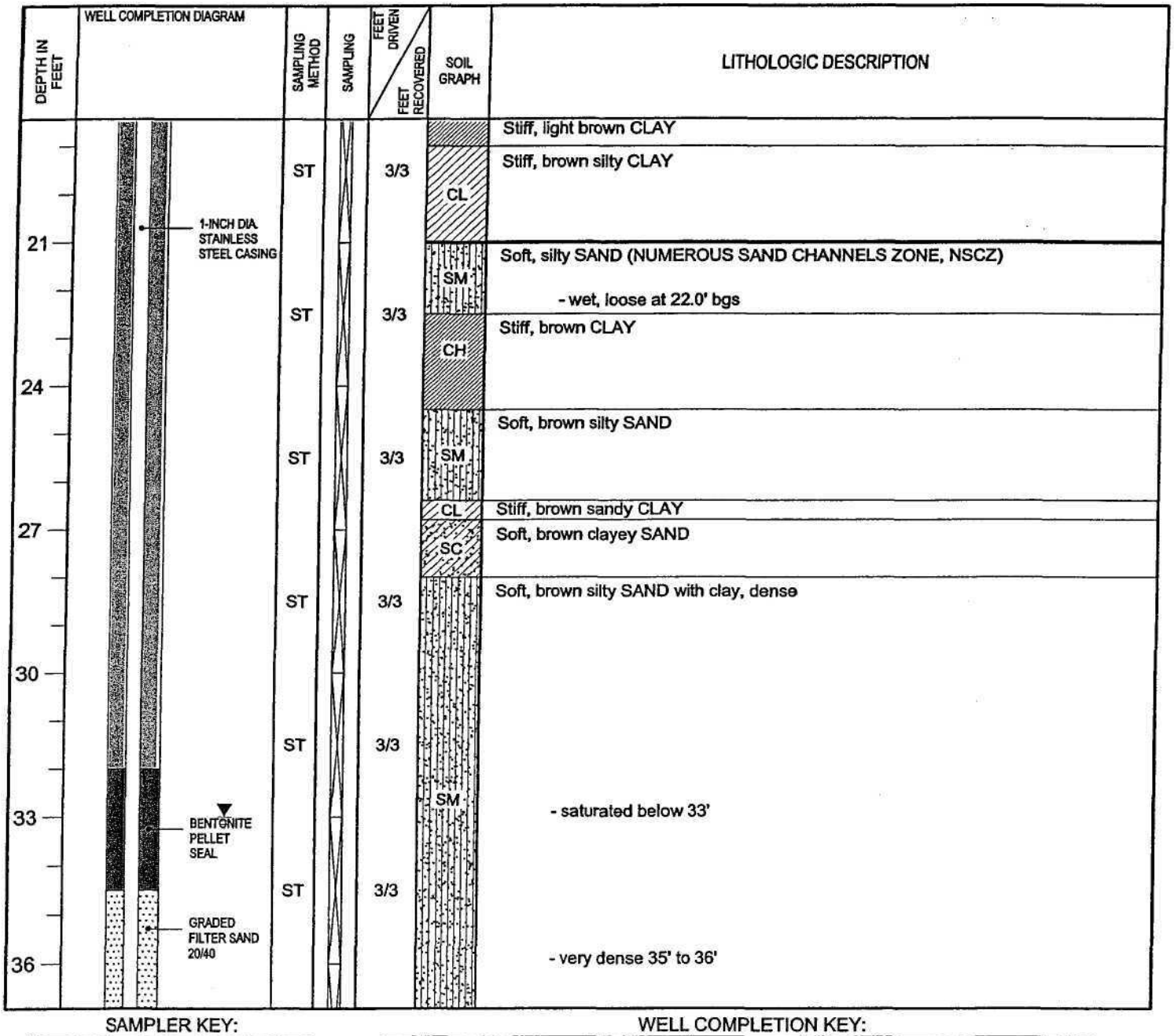
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: **DO1PZ (cont'd)**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/16/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,070.5095 E 3,207,812.7553
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 33.0'
ELEVATION (TOC): 33.88'
INITIAL GROUNDWATER DEPTH: 22.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: **D01PZ (cont'd)**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/16/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,070.5095 E 3,207,812.7553
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 33.0'
ELEVATION (TOC): 33.88'
INITIAL GROUNDWATER DEPTH: 22.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY
PAGE: 3 OF 3

DEPTH IN FEET	WELL COMPLETION DIAGRAM	SAMPLING METHOD	SAMPLING	FEET DRIVEN / FEET RECOVERED	SOIL GRAPH	LITHOLOGIC DESCRIPTION
39	GRADED FILTER SAND 20/40	ST		3/3		
		ST		3/3		
42	1-INCH DIA. STAINLESS STEEL WELL SCREEN				SM	
		ST		3/3		- wet and loose below 44' bgs
45		ST		2/2		
48	BOTTOM CAP					Boring D01PZ terminated at 47.25 feet below ground surface. Bottom of well at 47' BGS.
51						
54						

SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

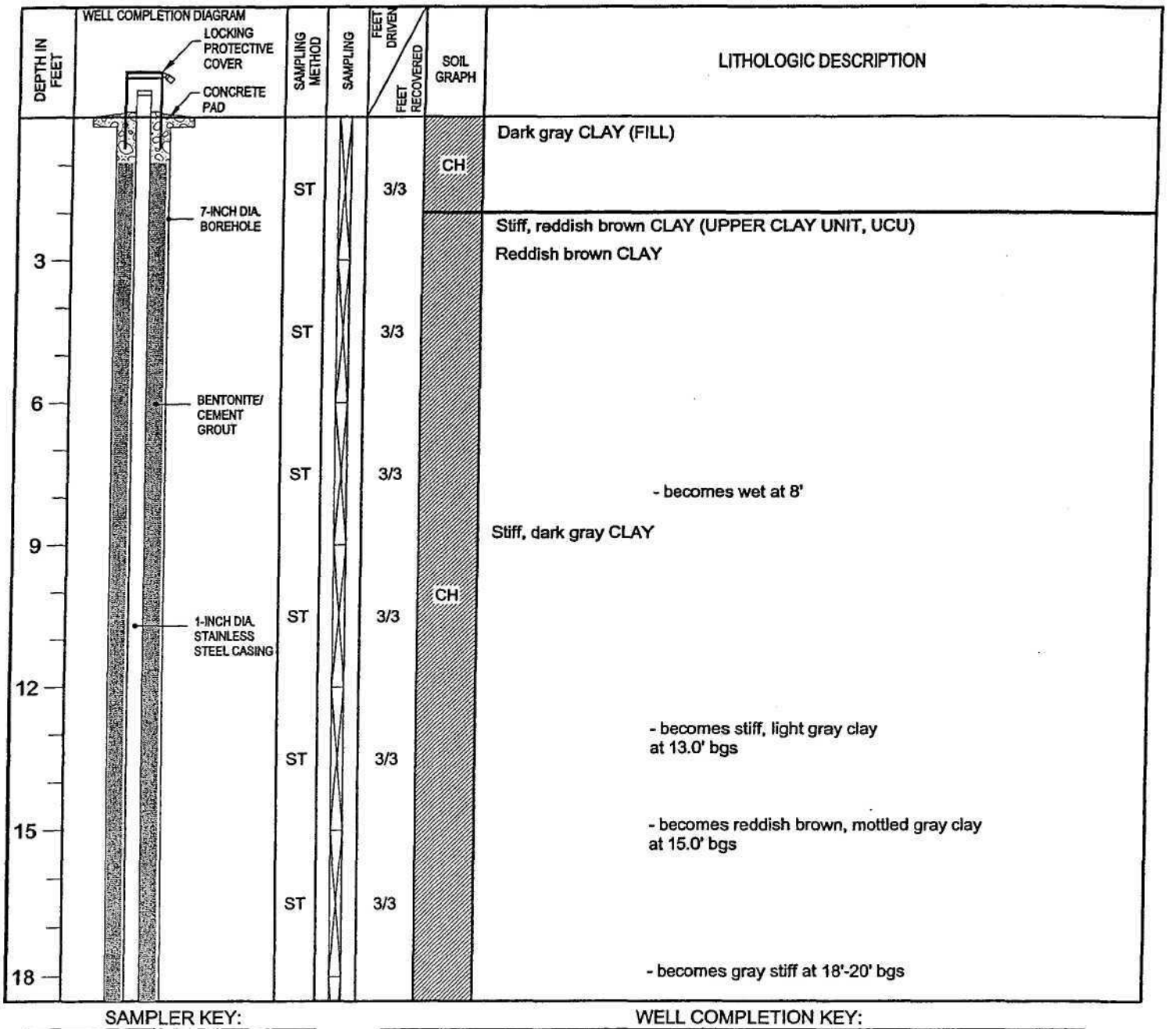
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: **DO2PZ**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/16/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 650,946.6023 E 3,207,946.7344
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 32.6'
ELEVATION (TOC): 34.15'
INITIAL GROUNDWATER DEPTH : 29.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

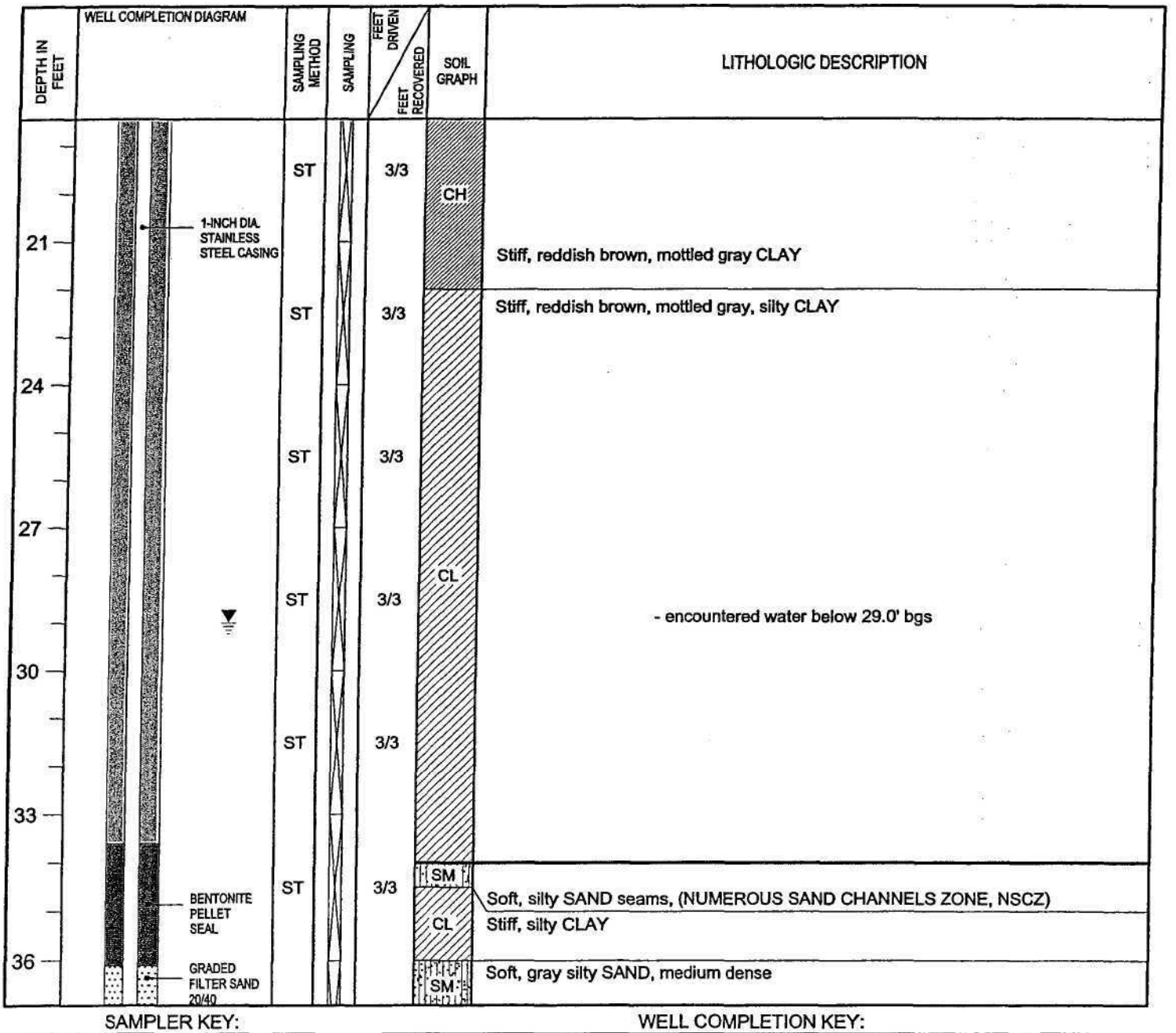
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: DO2PZ (cont'd)

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/16/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 650,946.6023 E 3,207,946.7344
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 32.6'
ELEVATION (TOC): 34.15'
INITIAL GROUNDWATER DEPTH: 29.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: **D02PZ (cont'd)**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/16/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 650,946.6023 E 3,207,946.7344
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 32.6'
ELEVATION (TOC): 34.15'
INITIAL GROUNDWATER DEPTH: 29.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY
PAGE: 3 OF 3

DEPTH IN FEET	WELL COMPLETION DIAGRAM	SAMPLING METHOD	SAMPLING	FEET DRIVEN / FEET RECOVERED	SOIL GRAPH	LITHOLOGIC DESCRIPTION
39	GRADED FILTER SAND 20/40	ST		3/3		
42		ST		3/3	SM	
45	1-INCH DIA. STAINLESS STEEL WELL SCREEN	ST		3/3		- becomes dense at 45' bgs
48	BOTTOM CAP	ST		3/3		Boring D02PZ terminated at 48.35 feet below ground surface. Bottom of well at 48.10' BGS.
51						
54						

SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

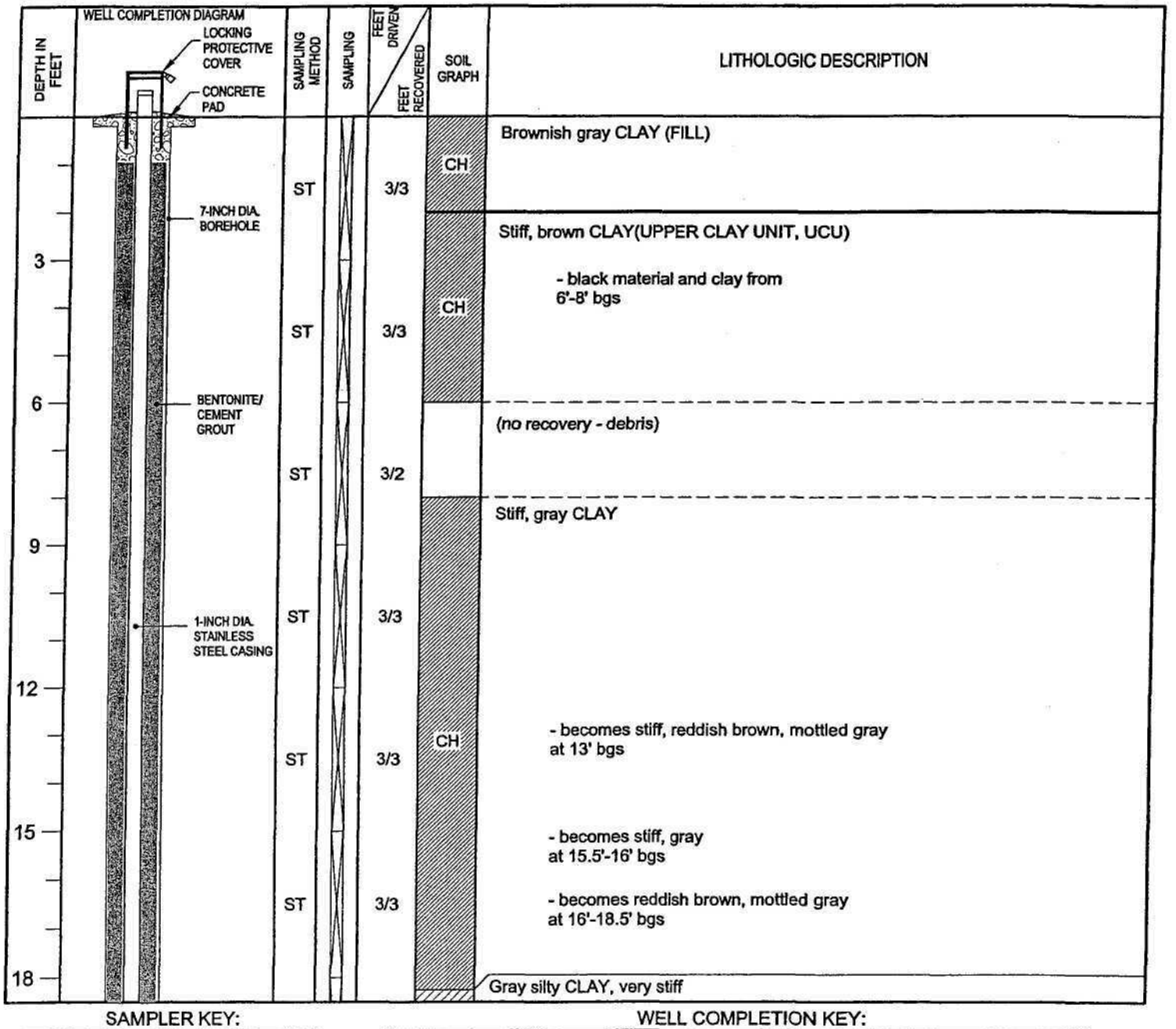
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: **DO3PZ**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/20/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 650,882.89 E 3,208,046.04
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV. : 32.8'
ELEVATION (TOC): 34.61'
INITIAL GROUNDWATER DEPTH : 21.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

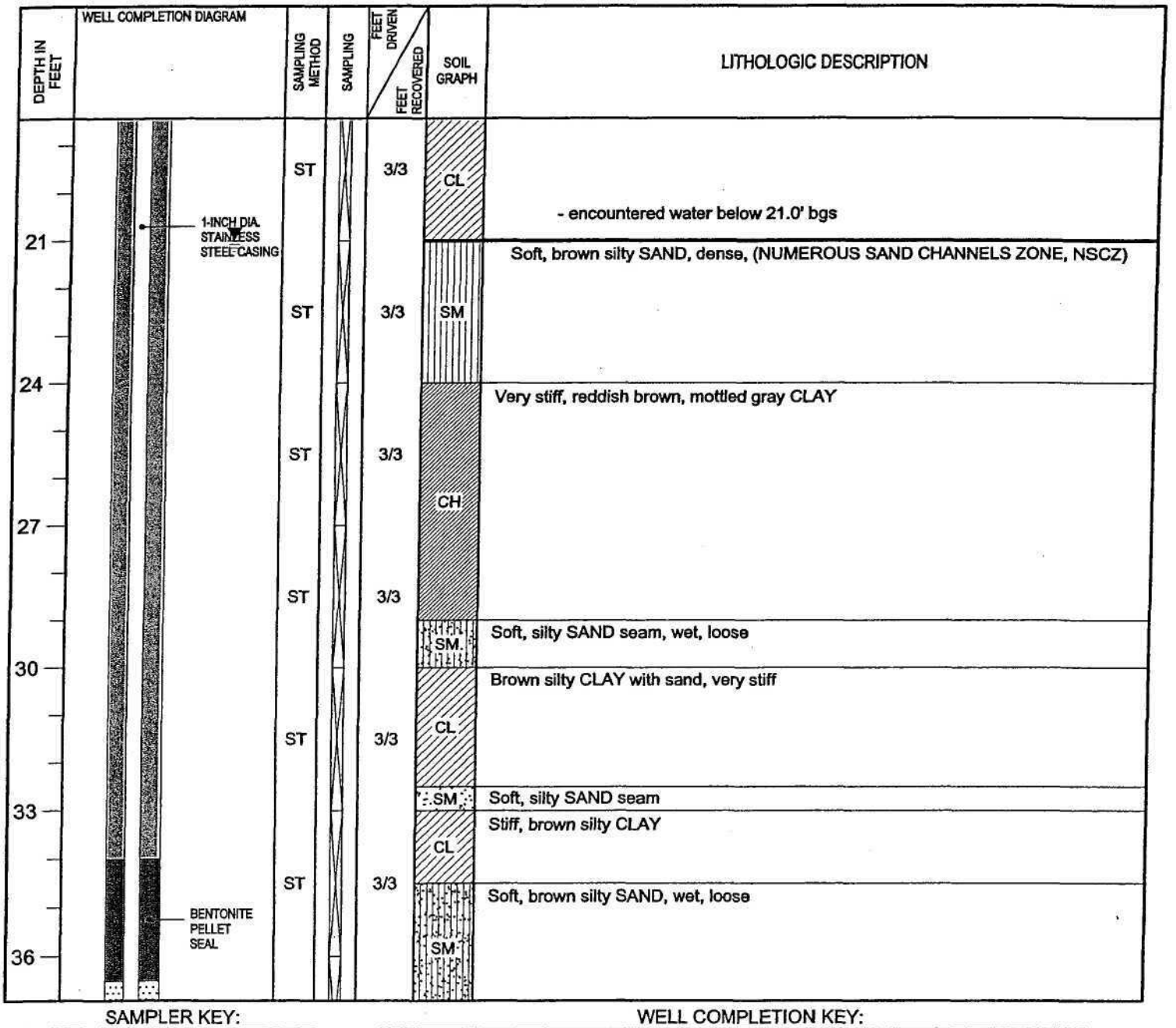
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: **DO3PZ (cont'd)**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/20/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 650,882.89 E 3,208,046.04
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 32.8'
ELEVATION (TOC): 34.61'
INITIAL GROUNDWATER DEPTH: 21.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

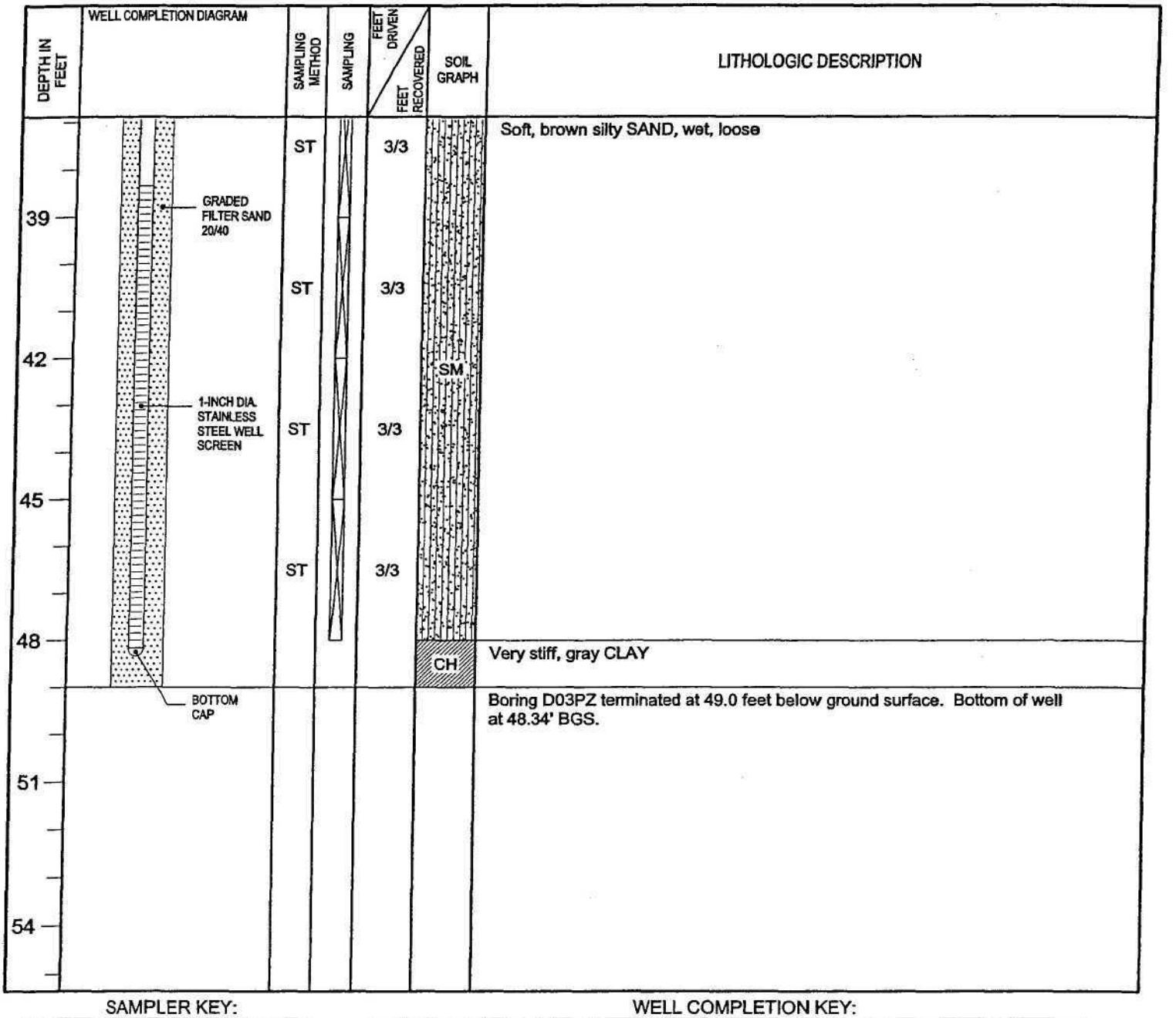
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: **D03PZ (cont'd)**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/20/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 650,882.89 E 3,208,046.04
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 32.8'
ELEVATION (TOC): 34.61'
INITIAL GROUNDWATER DEPTH: 21.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY
PAGE: 3 OF 3



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

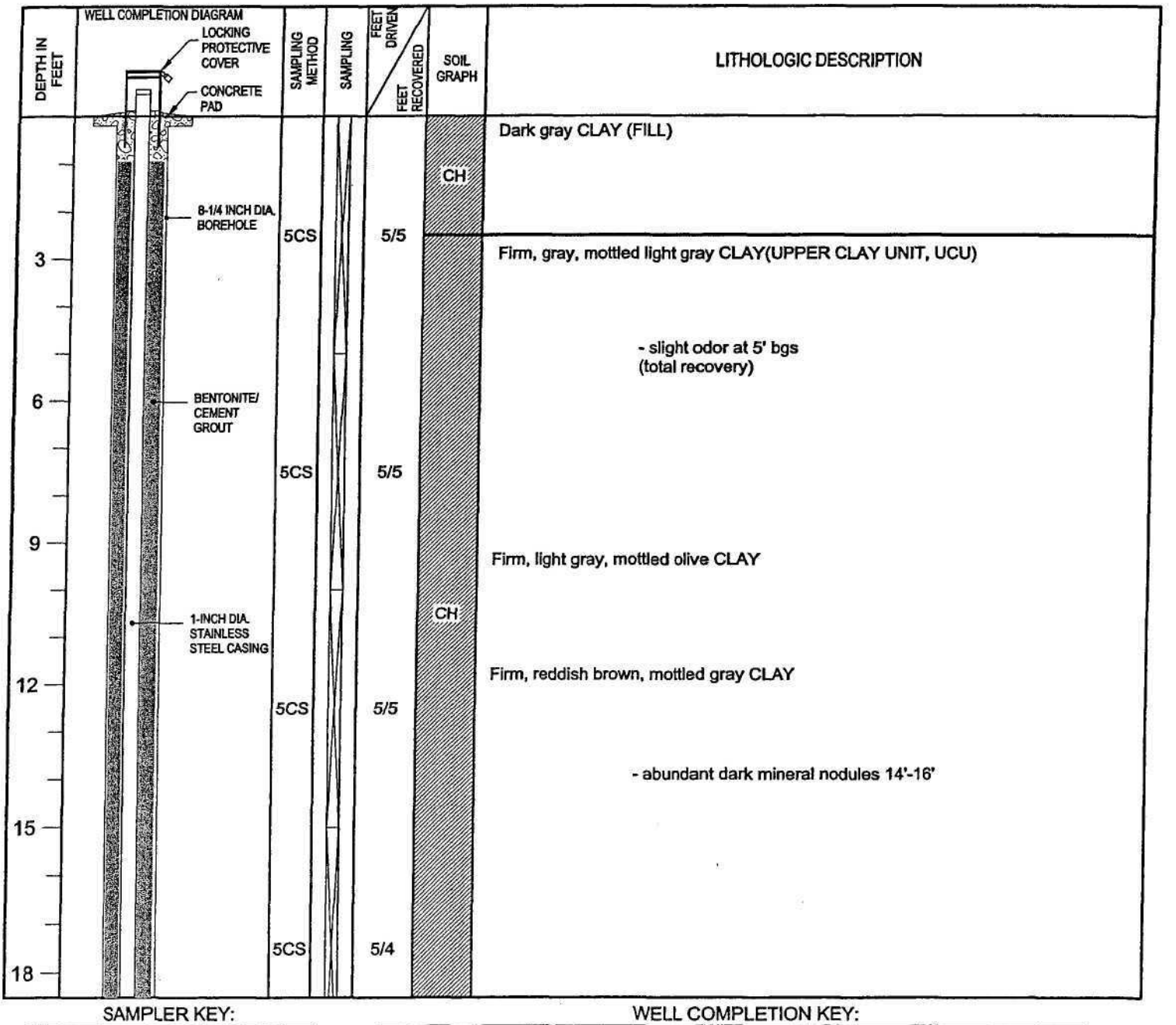
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: DO4PZ

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/16/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: FUGRO
BOREHOLE DIA.: 8-1/4 in. MONITOR WELL DIA.: 1 in.
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,387.84 E 3,207,892.07
RIG TYPE: TRUCK-MOUNTED CME 75 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 30.5'
ELEVATION (TOC): 31.67'
INITIAL GROUNDWATER DEPTH : 21.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY
PAGE: 1 OF 3



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
5CS	5-FOOT CORE SAMPLER
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

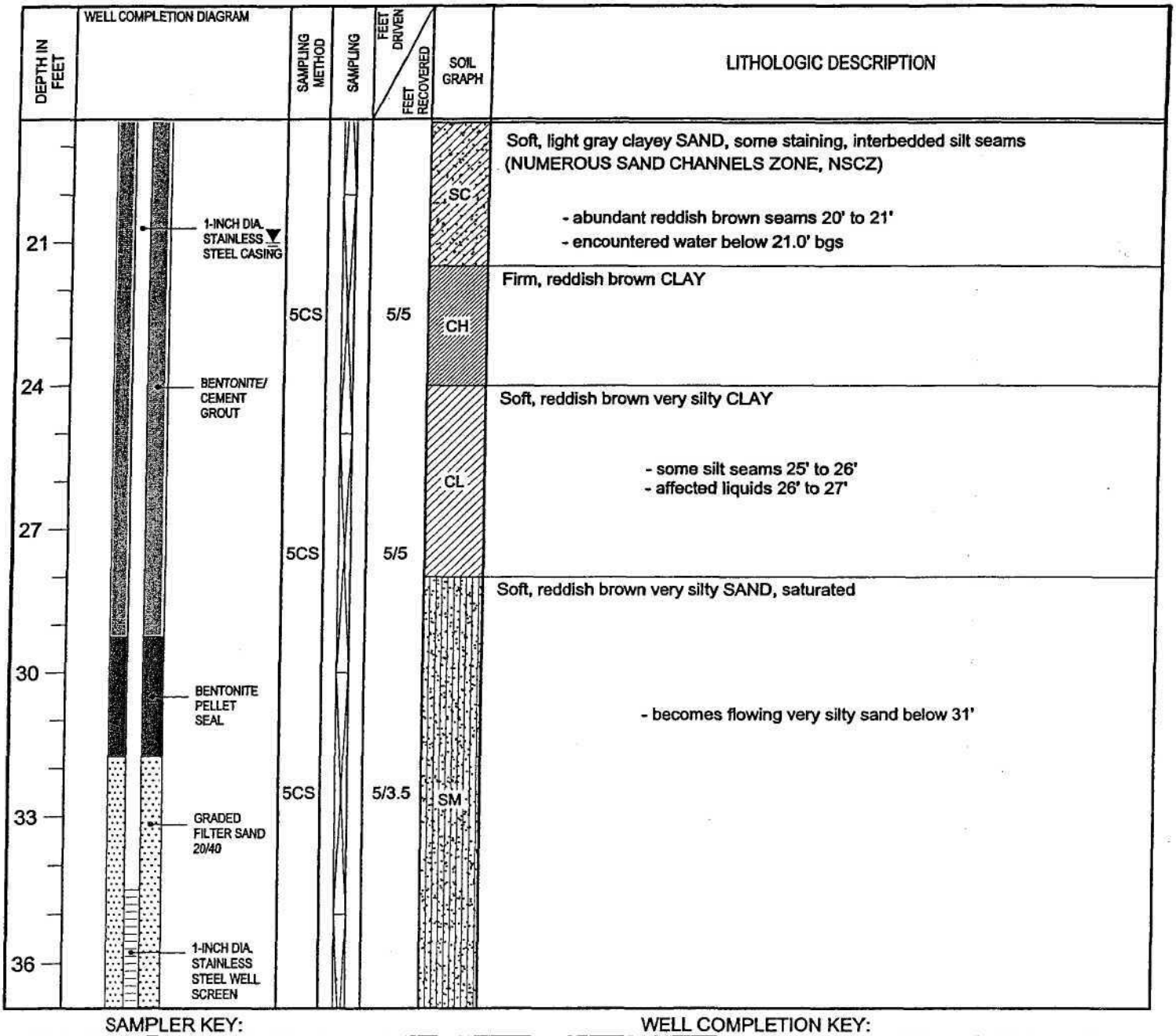
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▽	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: **DO4PZ (cont'd)**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/16/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: FUGRO
BOREHOLE DIA.: 8-1/4 in. MONITOR WELL DIA.: 1 in.
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,387.84 E 3,207,892.07
RIG TYPE: TRUCK-MOUNTED CME 75 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 30.5'
ELEVATION (TOC): 31.67'
INITIAL GROUNDWATER DEPTH: 21.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
5CS	5-FOOT CORE SAMPLER
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: **D04PZ (cont'd)**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/16/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: FUGRO
BOREHOLE DIA.: 8-1/4 in. MONITOR WELL DIA.: 1 in.
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,387.84 E 3,207,892.07
RIG TYPE: TRUCK-MOUNTED CME 75 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 30.5'
ELEVATION (TOC): 31.67'
INITIAL GROUNDWATER DEPTH: 21.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY
PAGE: 3 OF 3

DEPTH IN FEET	WELL COMPLETION DIAGRAM	SAMPLING METHOD	SAMPLING	FEET DRIVEN / FEET RECOVERED	SOIL GRAPH	LITHOLOGIC DESCRIPTION
39	1-INCH DIA. STAINLESS STEEL WELL SCREEN	5CS		5/5	SM	- saturated and affected liquids 39' to 40'
42		5CS		4.75/4.75	CH	Soft, silty CLAY and abundant silt seams below 43'
45	BOTTOM CAP					Boring D04PZ terminated at 44.75 feet below ground surface. Bottom of well at 44.50' BGS.
48						
51						
54						

SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
5CS	5-FOOT CORE SAMPLER
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

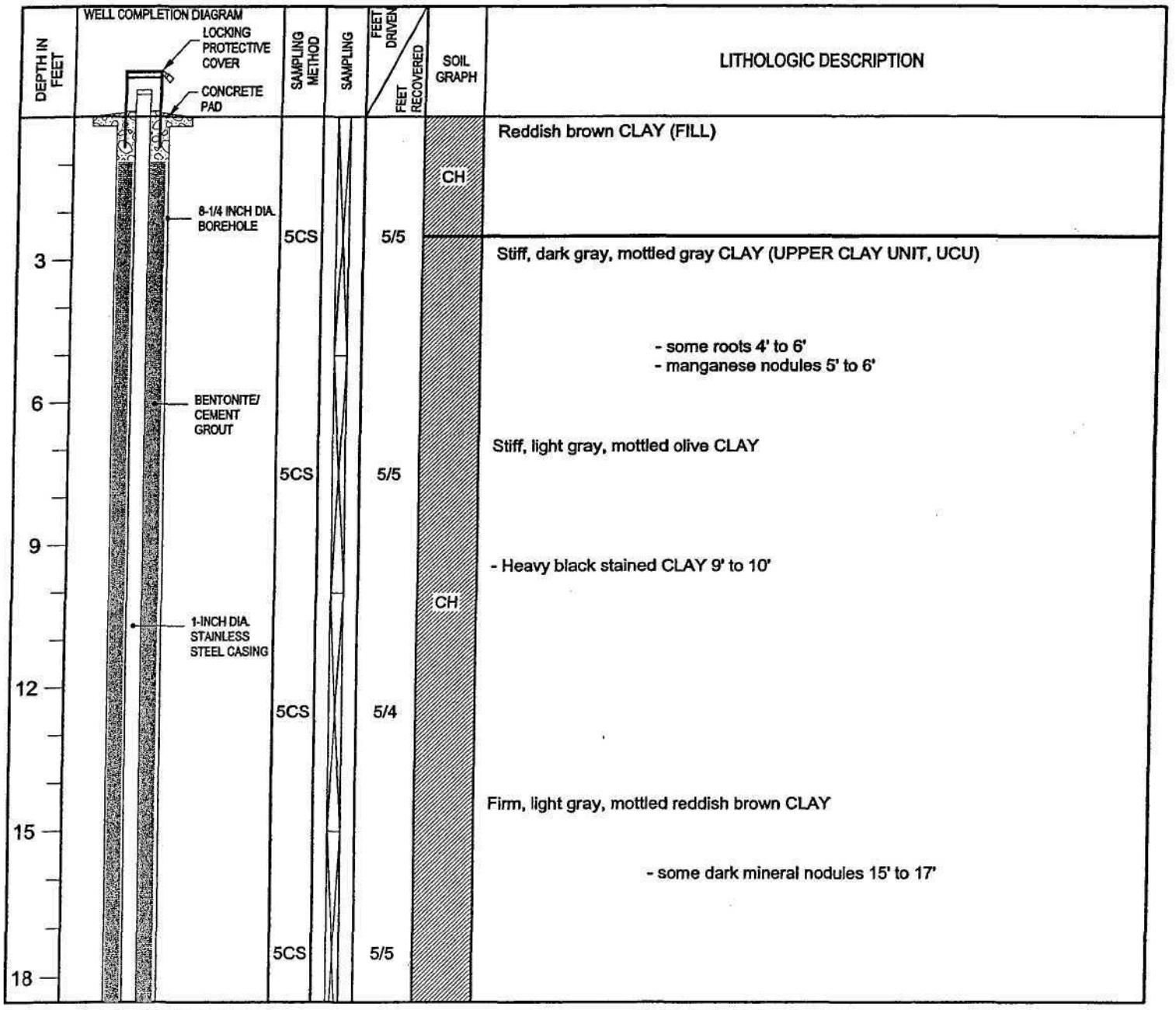
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: **DO5PZ**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/16/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: FUGRO
BOREHOLE DIA.: 8-1/4 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,290.9511 E 3,208,069.5945
RIG TYPE: TRUCK-MOUNTED CME 75 ROTARY DRILL
BEDDING LAYER SURFACE ELEV. : 35.7'
ELEVATION (TOC): 37.03'
INITIAL GROUNDWATER DEPTH : 24.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
5CS	5-FOOT CORE SAMPLER
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: DO5PZ (cont'd)

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/16/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: FUGRO
BOREHOLE DIA.: 8-1/4 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,290.9511 E 3,208,069.5945
RIG TYPE: TRUCK-MOUNTED CME 75 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 35.7'
ELEVATION (TOC): 37.03'
INITIAL GROUNDWATER DEPTH: 24.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY

DEPTH IN FEET	WELL COMPLETION DIAGRAM	SAMPLING METHOD	SAMPLING	FEET DRIVEN / FEET RECOVERED	SOIL GRAPH	LITHOLOGIC DESCRIPTION
					CH	Stiff light brown CLAY
21	BENTONITE/ CEMENT GROUT	5CS		5/5	CL	Soft, light gray, mottled light yellow very silty CLAY moist
24	▼					- encountered water at 24.0' bgs
	1-INCH DIA. STAINLESS STEEL CASING				SC	Soft, light gray very silty clayey SAND, with abundant black stains, saturated (NUMEROUS SAND CHANNELS ZONE, NSCZ)
27		5CS		5/5		
					CL	Soft, light tan silty CLAY, abundant silt seams
30					CH	Stiff, reddish brown CLAY, abundant black staining
					SC	Soft, reddish brown clayey SAND
		5CS		5/5		- clay seams 32' to 35'
33						- abundant staining 32' to 35'
36	BENTONITE PELLET SEAL					

SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
5CS	5-FOOT CORE SAMPLER
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

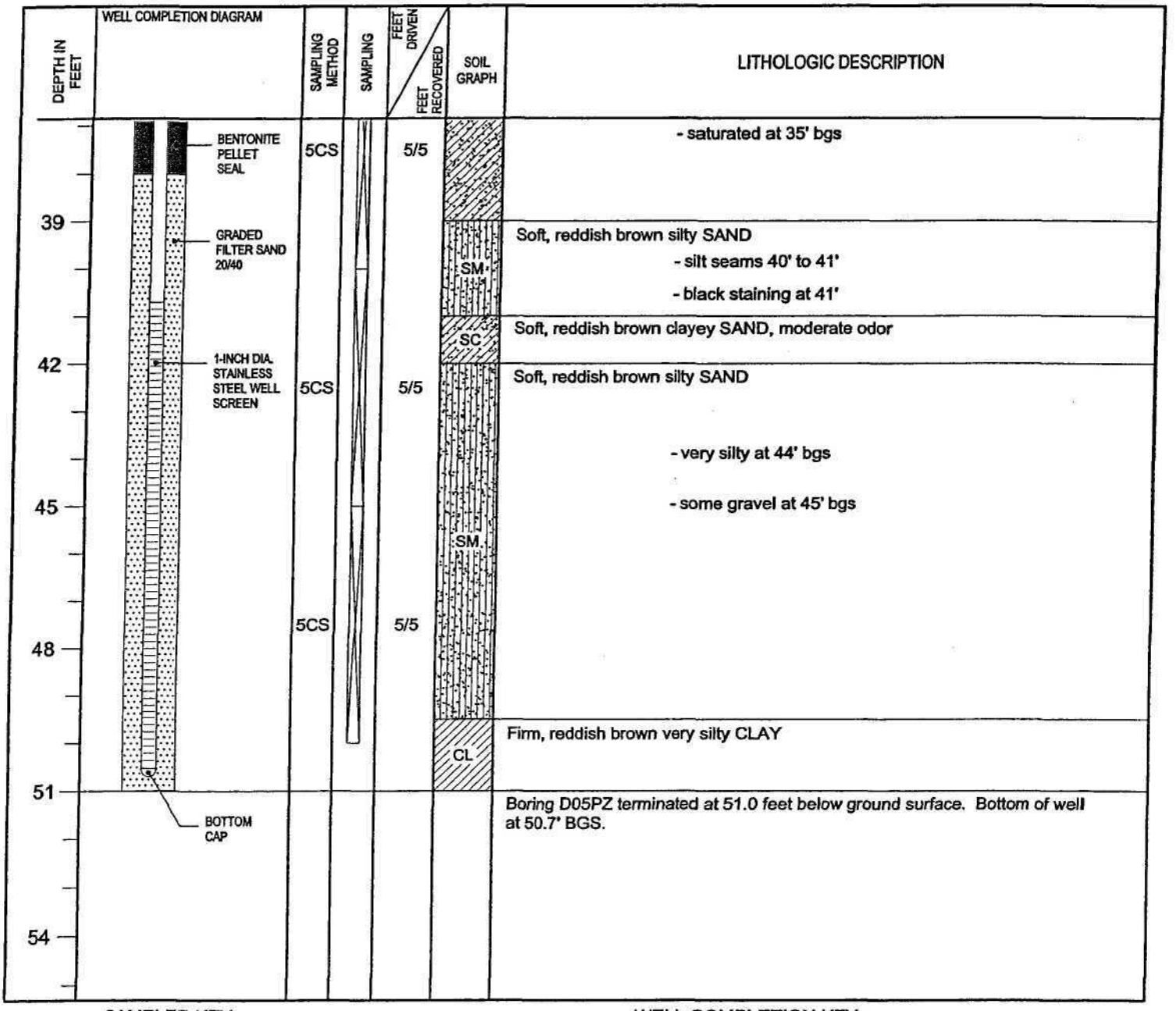
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: **D05PZ (cont'd)**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/16/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: FUGRO
BOREHOLE DIA.: 8-1/4 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,290.9511 E 3,208,069.5945
RIG TYPE: TRUCK-MOUNTED CME 75 ROTARY DRILL
BEDDING LAYER SURFACE ELEV. : 35.7'
ELEVATION (TOC): 37.03'
INITIAL GROUNDWATER DEPTH : 24.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
5CS	5-FOOT CORE SAMPLER
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

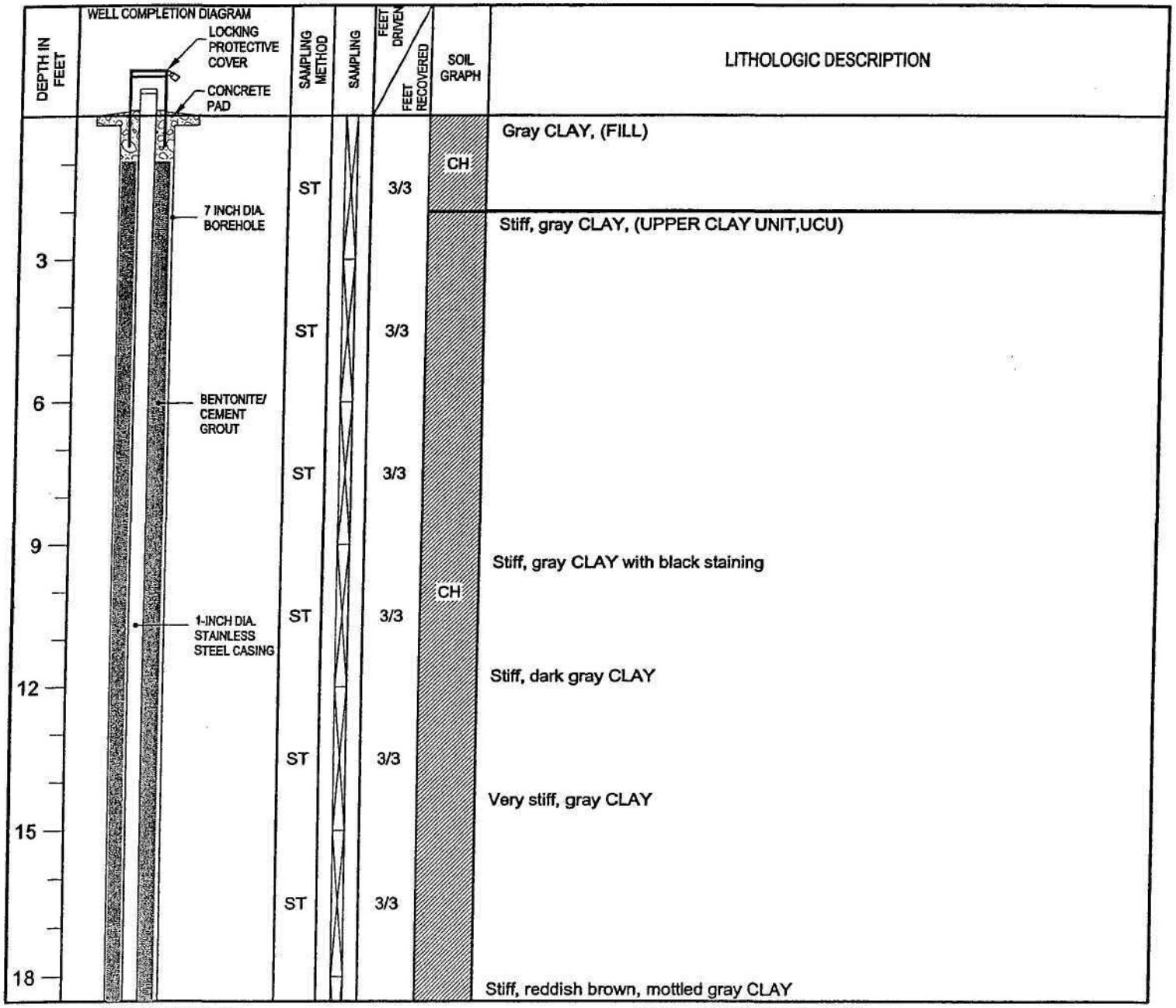
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMTER: DO6PZ

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/17/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,231.67 E 3,208,160.82
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 36.7'
ELEVATION (TOC): 37.65'
INITIAL GROUNDWATER DEPTH: 26.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

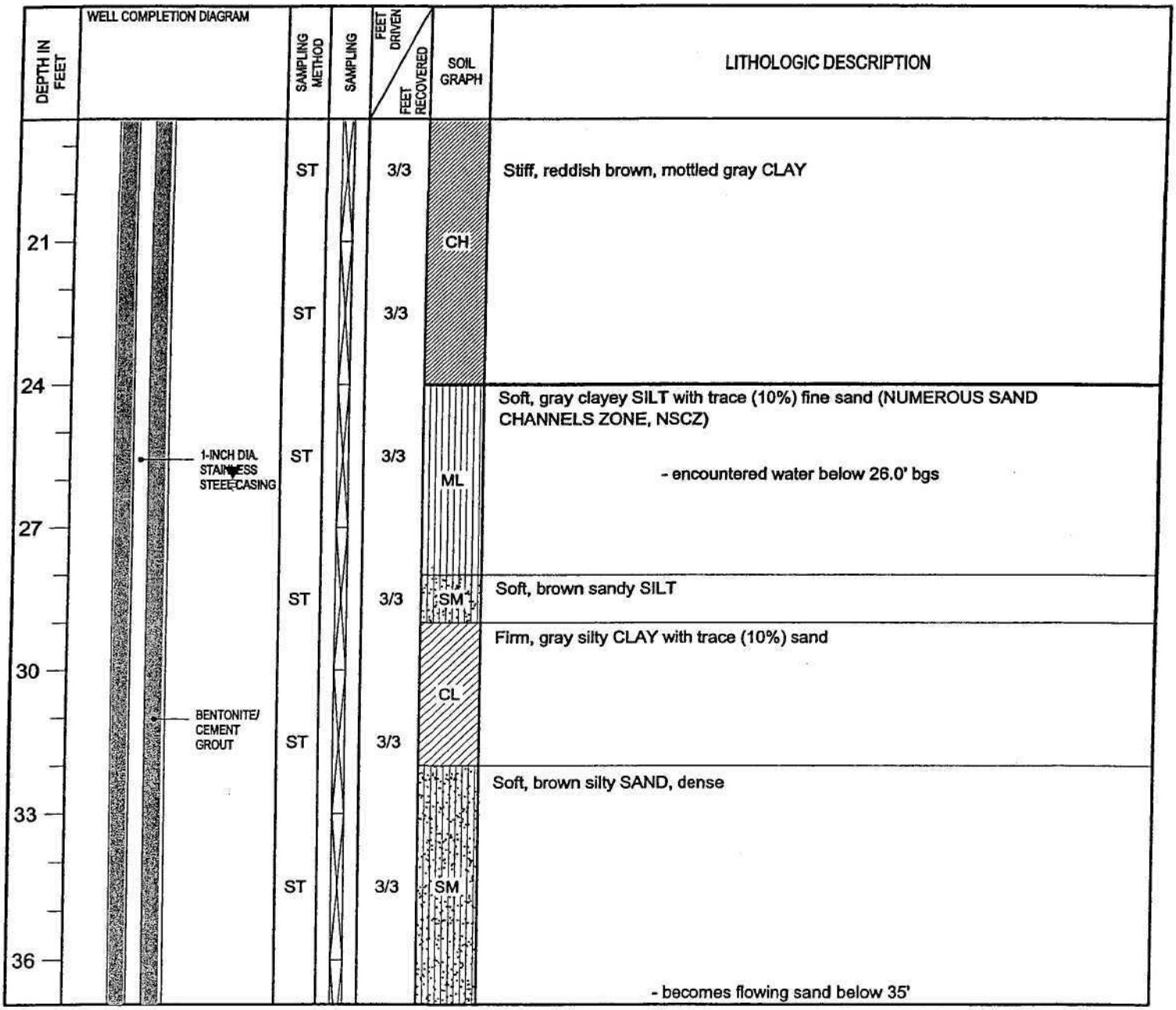
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMTER: DO6PZ (cont'd)

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/17/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,231.67 E 3,208,160.82
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV. : 36.7'
ELEVATION (TOC): 37.65'
INITIAL GROUNDWATER DEPTH : 26.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY
PAGE: 2 OF 3



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

WELL COMPLETION KEY:

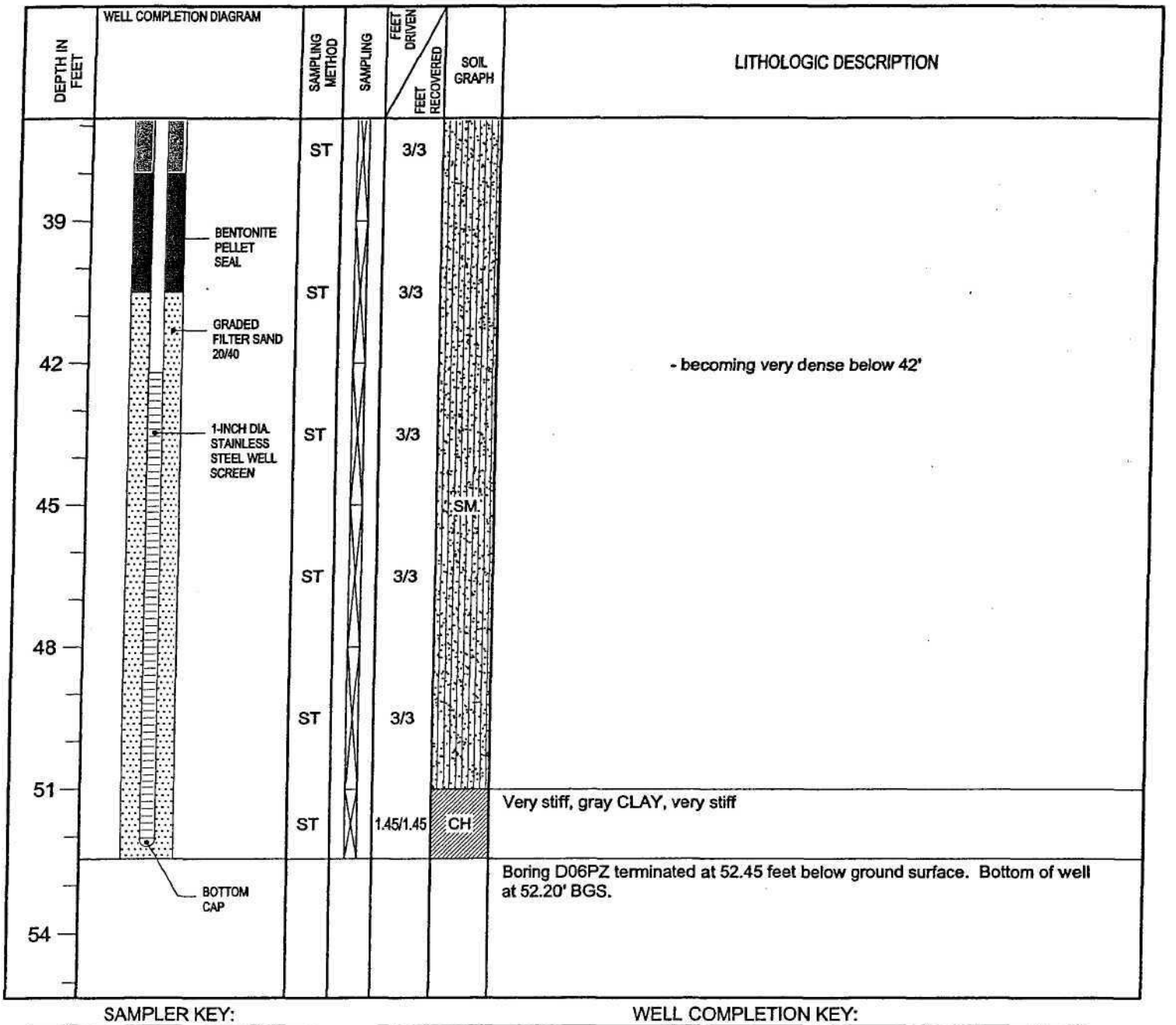
LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

002205

SOIL BORING/PIEZOMTER: **DO6PZ (cont'd)**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/17/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,231.67 E 3,208,160.82
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 36.7'
ELEVATION (TOC): 37.65'
INITIAL GROUNDWATER DEPTH: 26.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY
PAGE: 3 OF 3



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

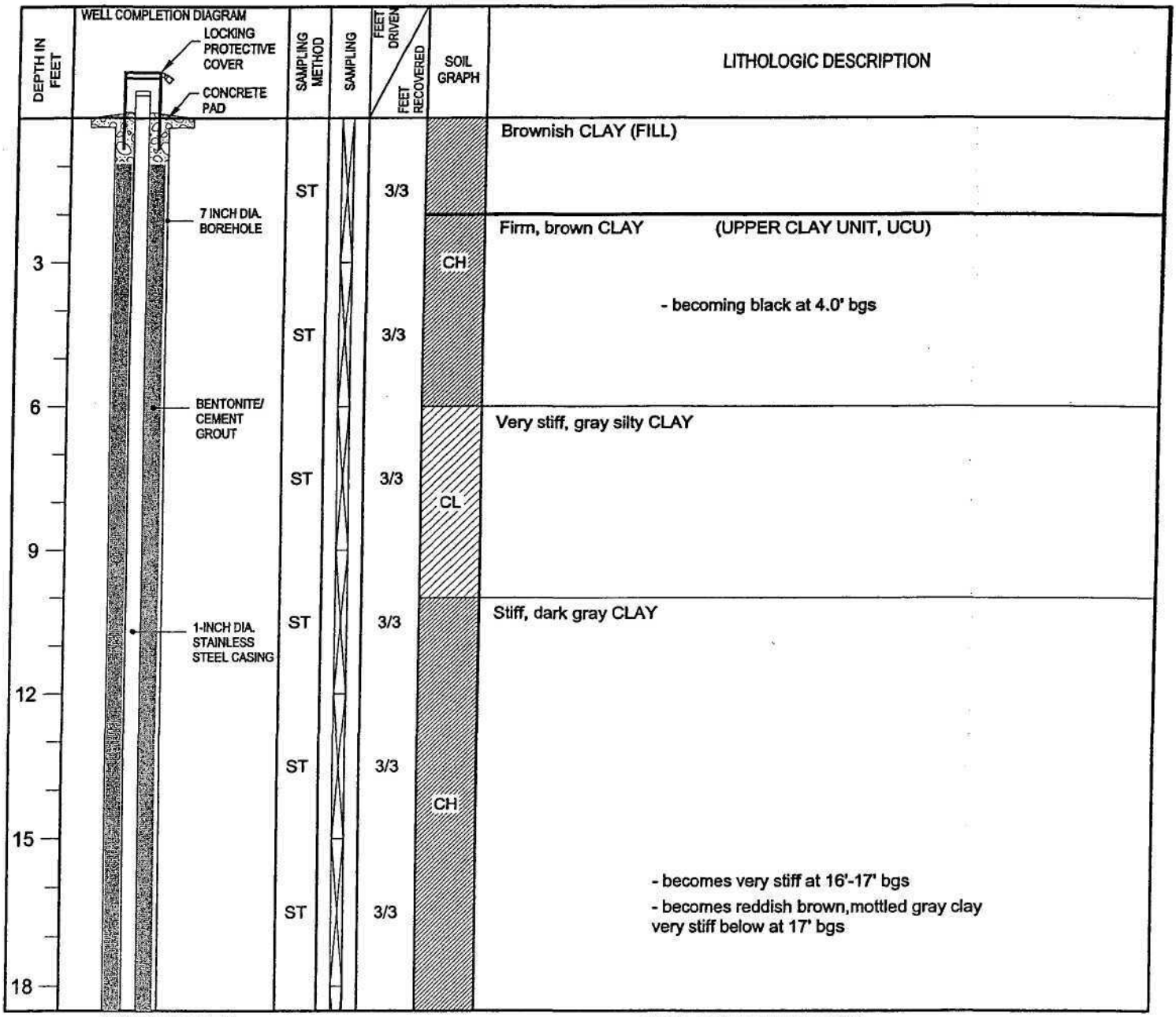
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: **DO7PZ**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/17/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,072.6594 E 3,208,276.1871
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 35.0'
ELEVATION (TOC): 36.15'
INITIAL GROUNDWATER DEPTH: 25.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY
PAGE: 1 OF 3



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

WELL COMPLETION KEY:

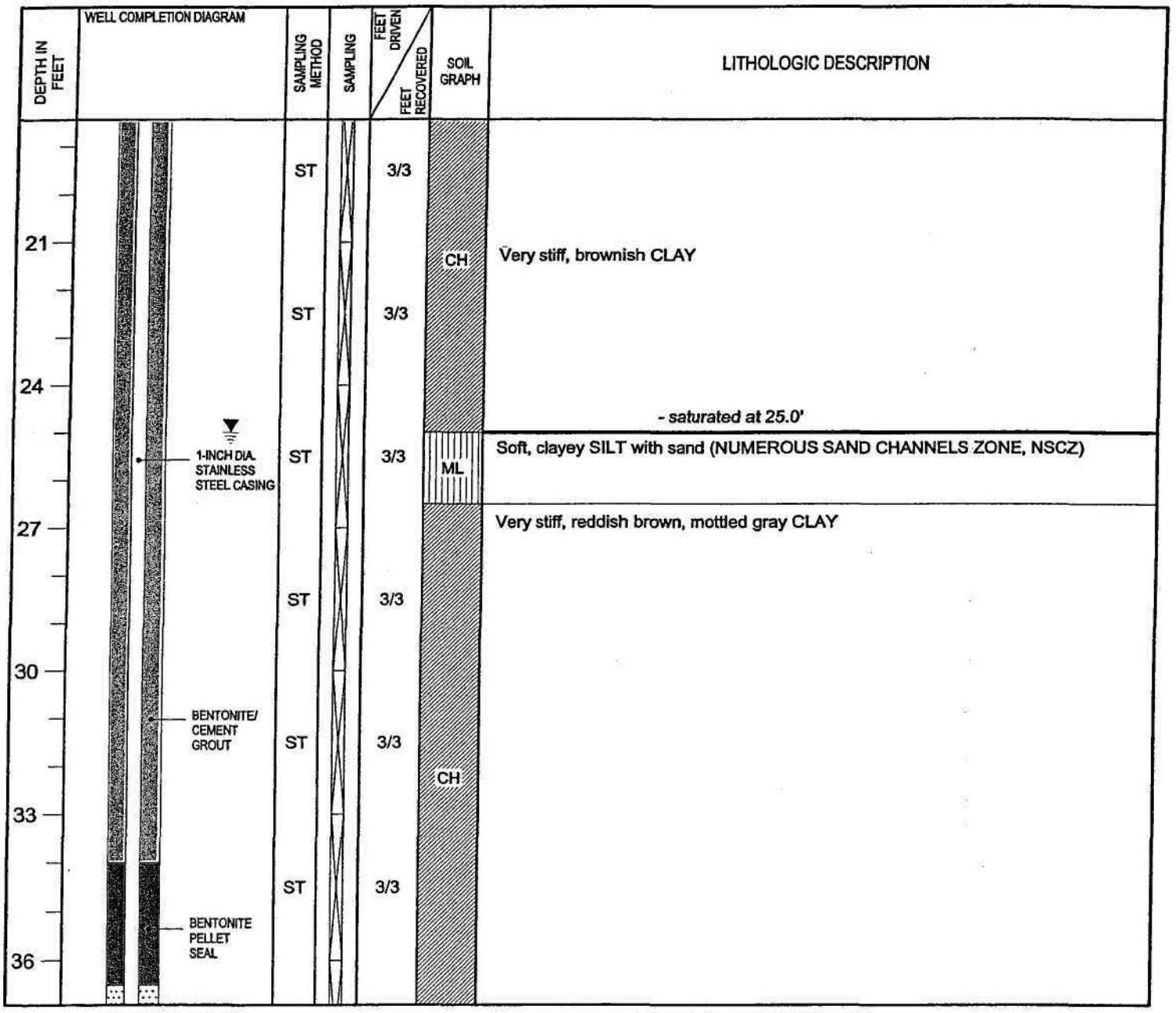
LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

002207

SOIL BORING/PIEZOMETER: **DO7PZ (cont'd)**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/17/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,072.6594 E 3,208,276.1872
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 35.0'
ELEVATION (TOC): 36.15'
INITIAL GROUNDWATER DEPTH: 25.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

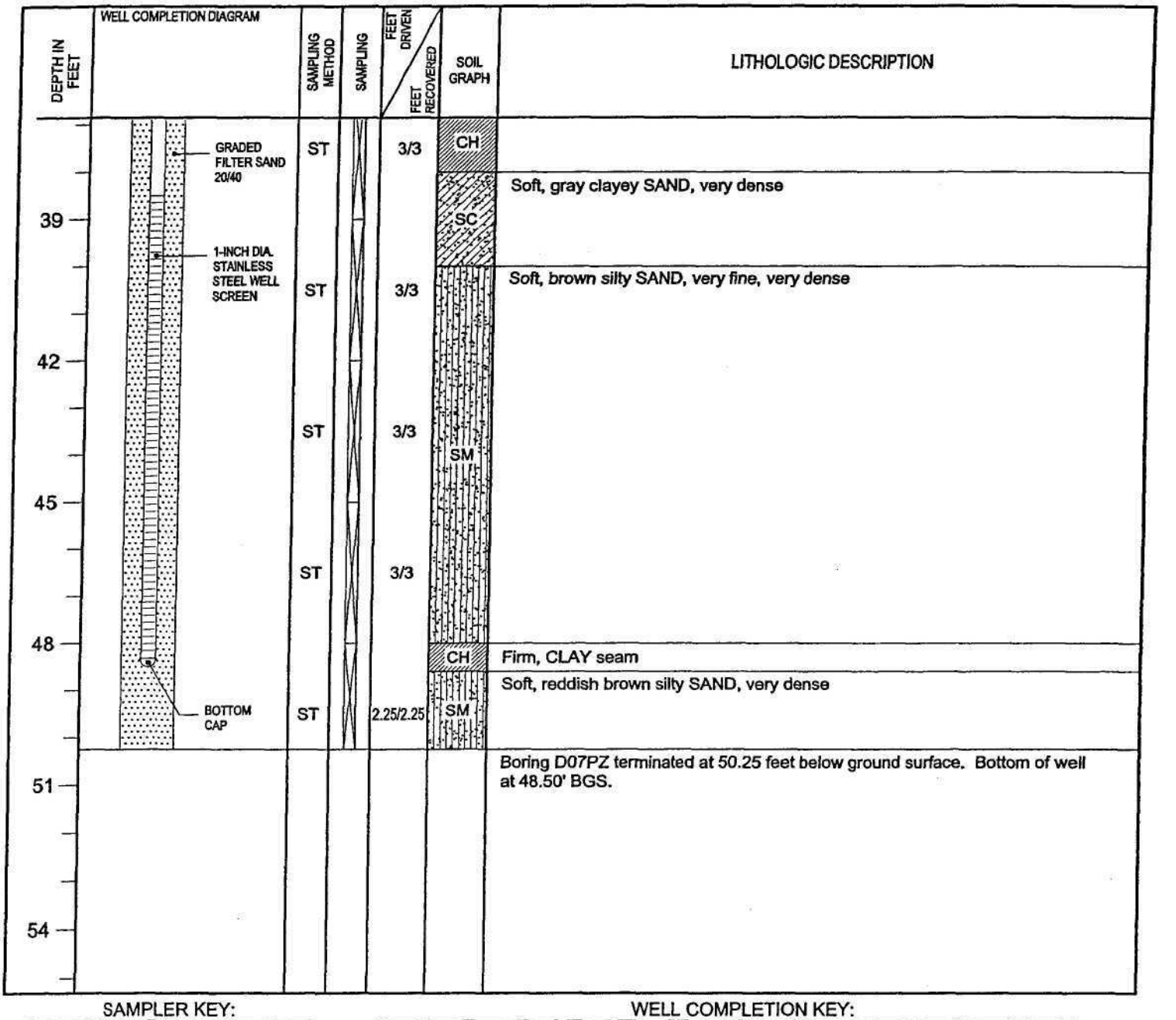
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: D07PZ (cont'd)

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/17/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,072.6594 E 3,208,276.1872
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 35.0'
ELEVATION (TOC): 36.15'
INITIAL GROUNDWATER DEPTH : 25.0' BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT

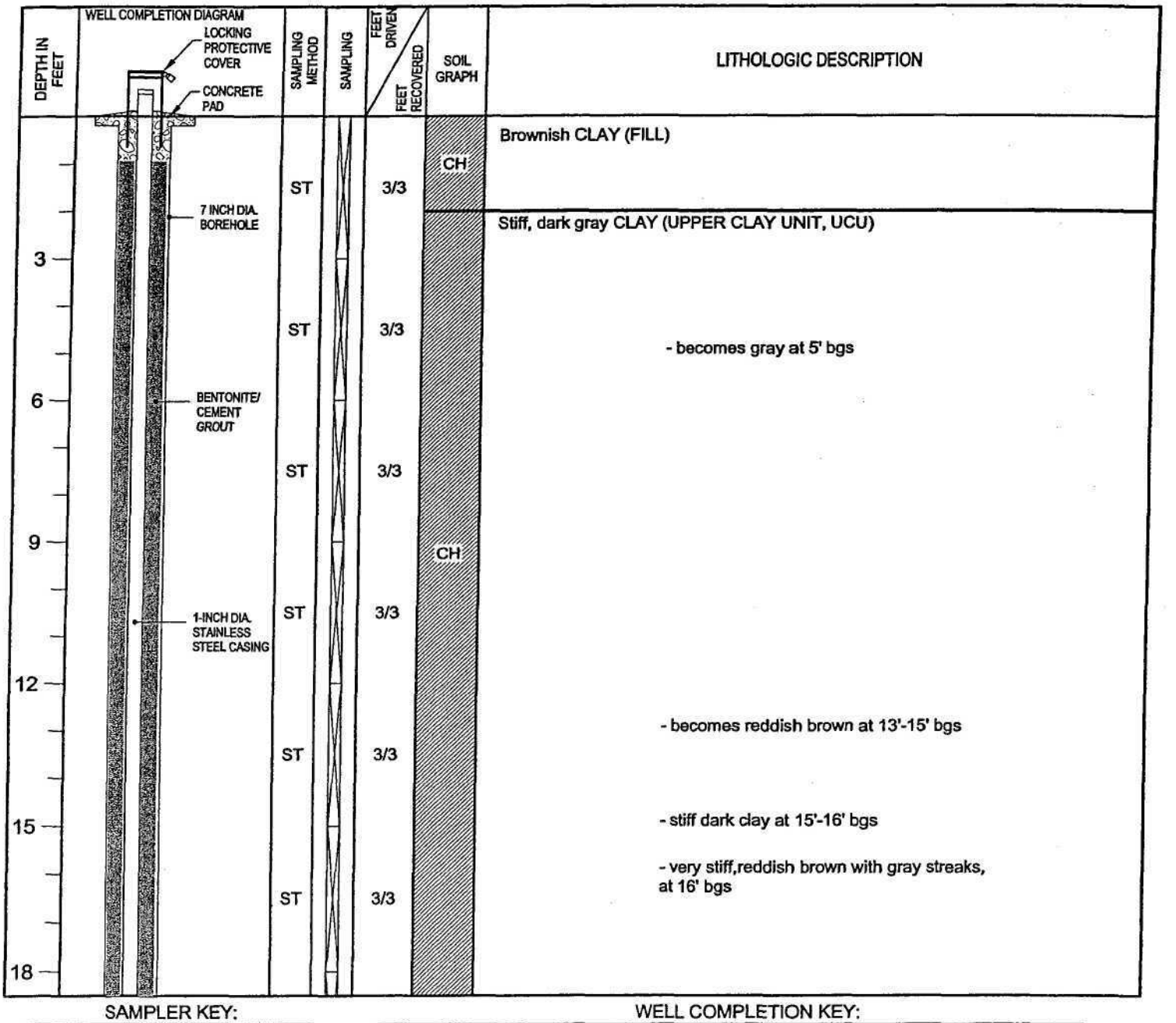
WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: **DO8PZ**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/18-19/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,993.72 E 3,208,390.65
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 31.8'
ELEVATION (TOC): 35.85'
INITIAL GROUNDWATER DEPTH : 22.50' BGS
SURFACE CONDITION: BEDDING LAYER CLAY



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: **DO8PZ (cont'd)**

CLIENT: BRIO SITE TASK FORCE | JOB No.: 807621 | DATE: 07/18-19/01

SITE: BRIO SOUTH | LOCATION: BRIO SOUTH, HOUSTON, TEXAS

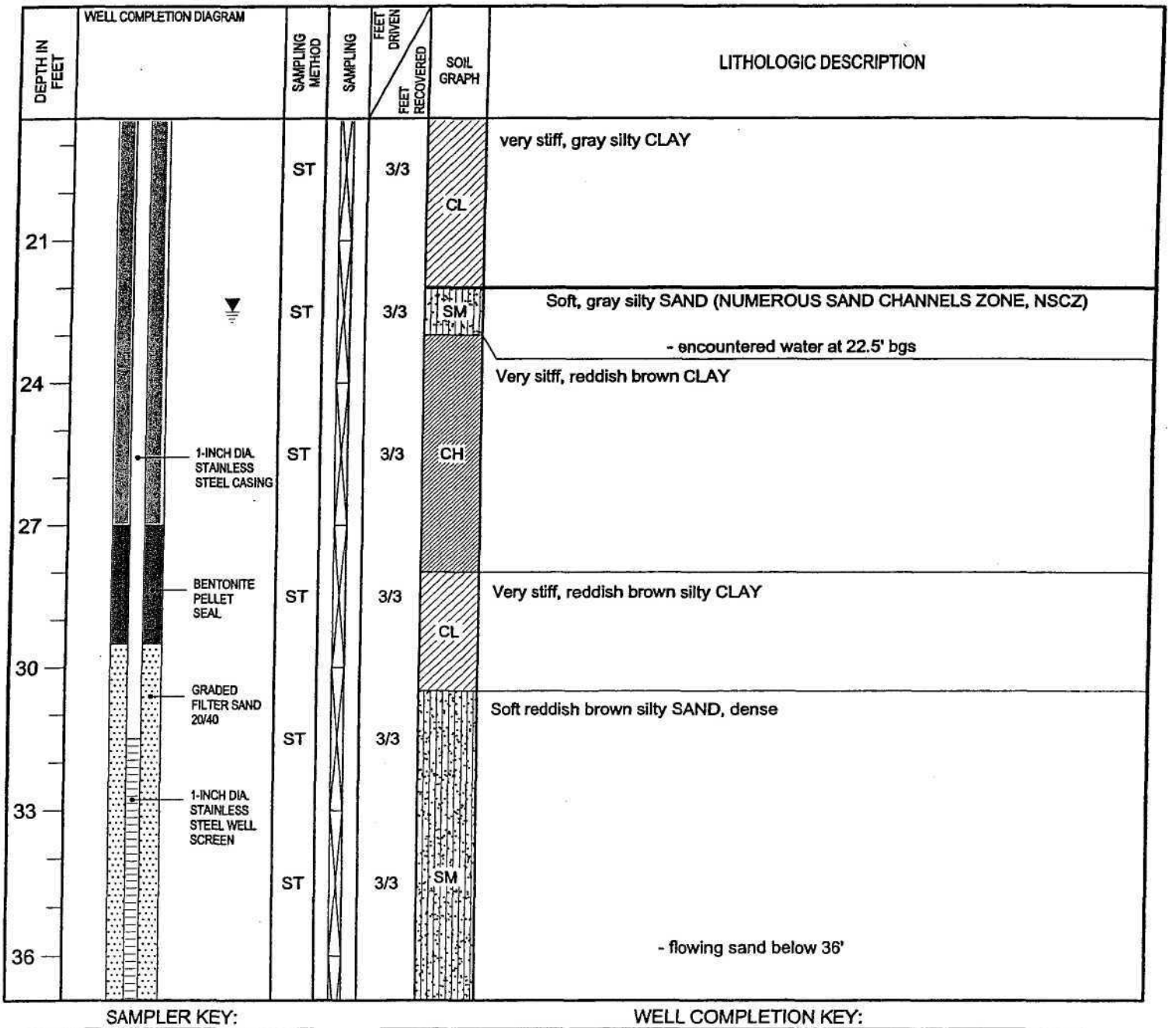
DRILLING CONTRACTOR: CCI | BOREHOLE DIA.: 7 inch | MONITOR WELL DIA.: 1 inch

DRILLING METHOD: HOLLOW-STEM AUGER | COORDINATES: N 651,993.72 E 3,208,390.65

RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL | BEDDING LAYER SURFACE ELEV.: 31.8'

ELEVATION (TOC): 35.85' | INITIAL GROUNDWATER DEPTH: 22.50' BGS

SURFACE CONDITION: BEDDING LAYER CLAY | PAGE: 2 OF 3



SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

WELL COMPLETION KEY:

LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

SOIL BORING/PIEZOMETER: **D08PZ (cont'd)**

CLIENT: BRIO SITE TASK FORCE
JOB No.: 807621 DATE: 07/18-19/01
SITE: BRIO SOUTH
LOCATION: BRIO SOUTH, HOUSTON, TEXAS
DRILLING CONTRACTOR: CCI
BOREHOLE DIA.: 7 inch MONITOR WELL DIA.: 1 inch
DRILLING METHOD: HOLLOW-STEM AUGER
COORDINATES: N 651,993.72 E 3,208,390.65
RIG TYPE: TRUCK-MOUNTED B-61 ROTARY DRILL
BEDDING LAYER SURFACE ELEV.: 31.8'
ELEVATION (TOC): 35.85'
INITIAL GROUNDWATER DEPTH: 22.50' BGS
SURFACE CONDITION: BEDDING LAYER CLAY
PAGE: 3 OF 3

DEPTH IN FEET	WELL COMPLETION DIAGRAM	SAMPLING METHOD	SAMPLING	FEET DRIVEN / FEET RECOVERED	SOIL GRAPH	LITHOLOGIC DESCRIPTION
39	GRADED FILTER SAND 20/40	ST		3/3		very dense at 40'
	1-INCH DIA. STAINLESS STEEL WELL SCREEN	ST		3/3	SM	
42	BOTTOM CAP	ST		2/2		presence mottled gray at 43'-43.5' bgs
45						Boring D08PZ terminated at 44.0 feet below ground surface. Bottom of well at 41.50' BGS.
48						
51						
54						

SAMPLER KEY:

SPT	STANDARD PENETRATION TEST SAMPLER
GP	GEOPROBE SAMPLER
ST	SHELBY TUBE
CT	AUGER CUTTING
TOC	TOP OF CASING
BTOC	BELOW TOP OF CASING
BGS	BELOW GROUND SURFACE
N/A	NOT APPLICABLE or NOT AVAILABLE

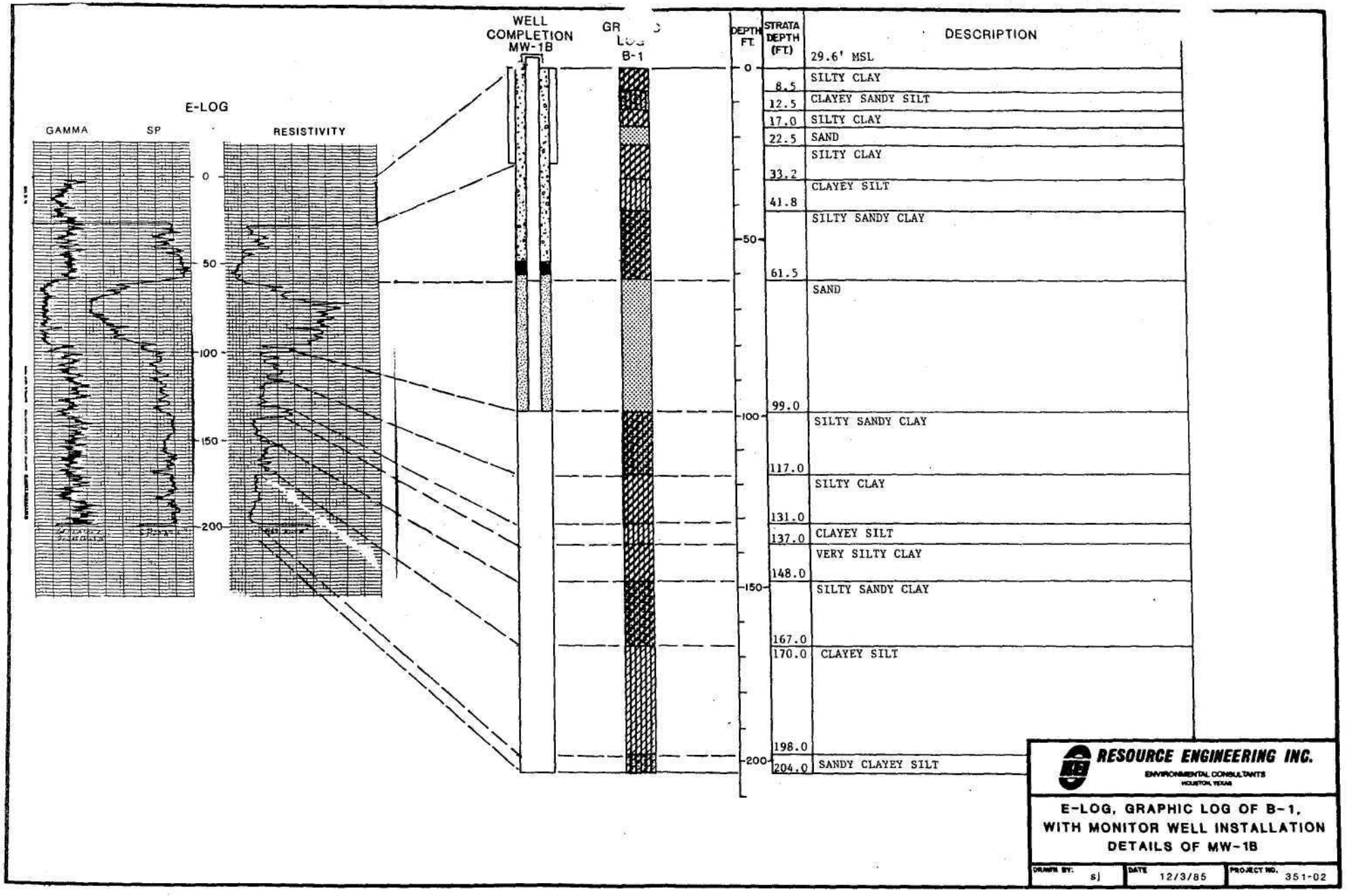
WELL COMPLETION KEY:

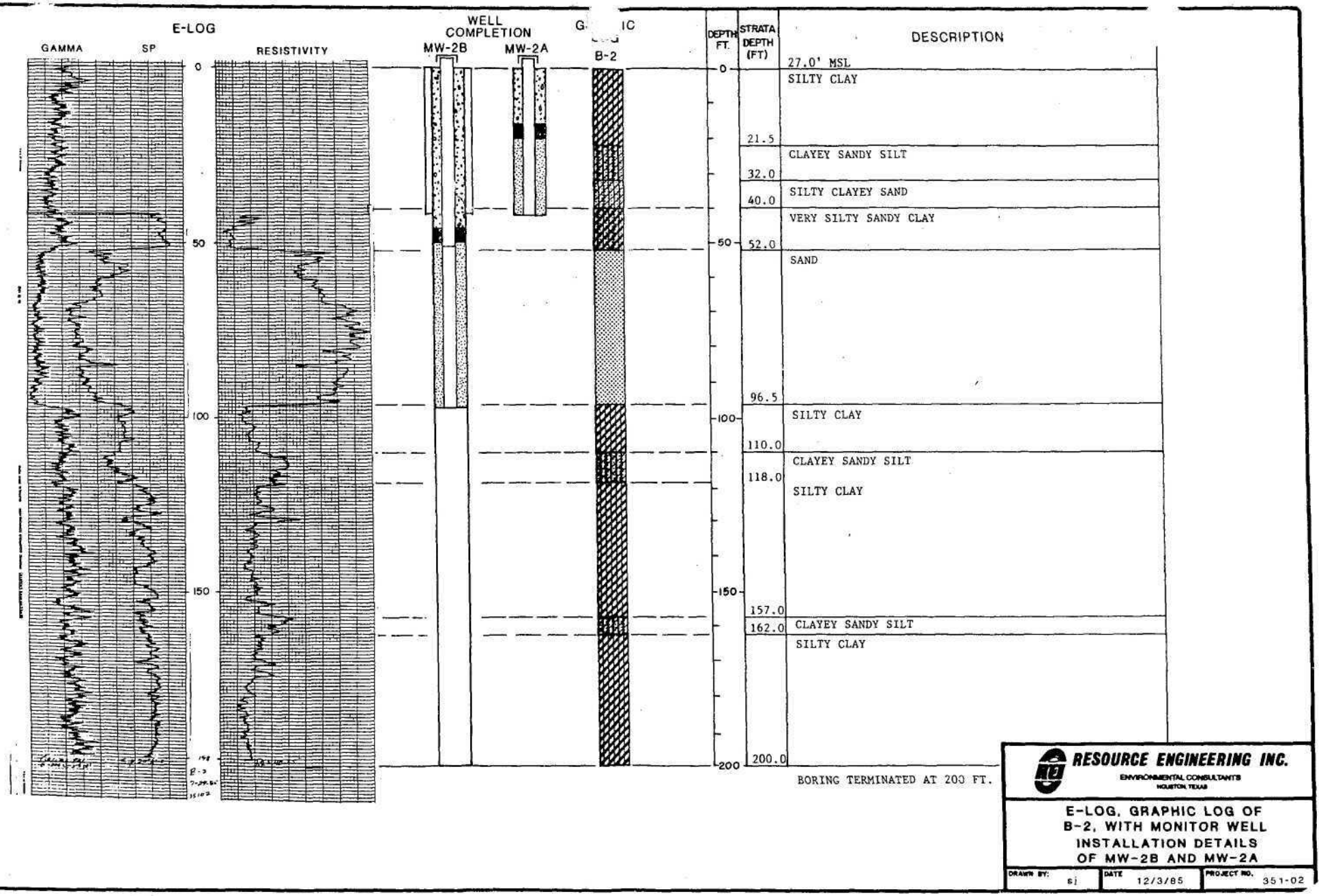
LP	LOCKING PROTECTION (ABOVE GROUND)
FP	FLUSHED PROTECTION (GROUND LEVEL)
BCG	BENTONITE/CEMENT GROUT
PVC	BLANK PVC CASING (1" or 4" DIA.)
BH	BOREHOLE
BS	BENTONITE SEAL
FS	FILTER SAND
SK	FILTER SOCK
SSC	STAINLESS STEEL CENTRALIZER
SCR	SCREEN, SLOTTED PVC (1" or 4" DIA.)
▼	GROUNDWATER LEVEL
BC	BOTTOM CAP

URS

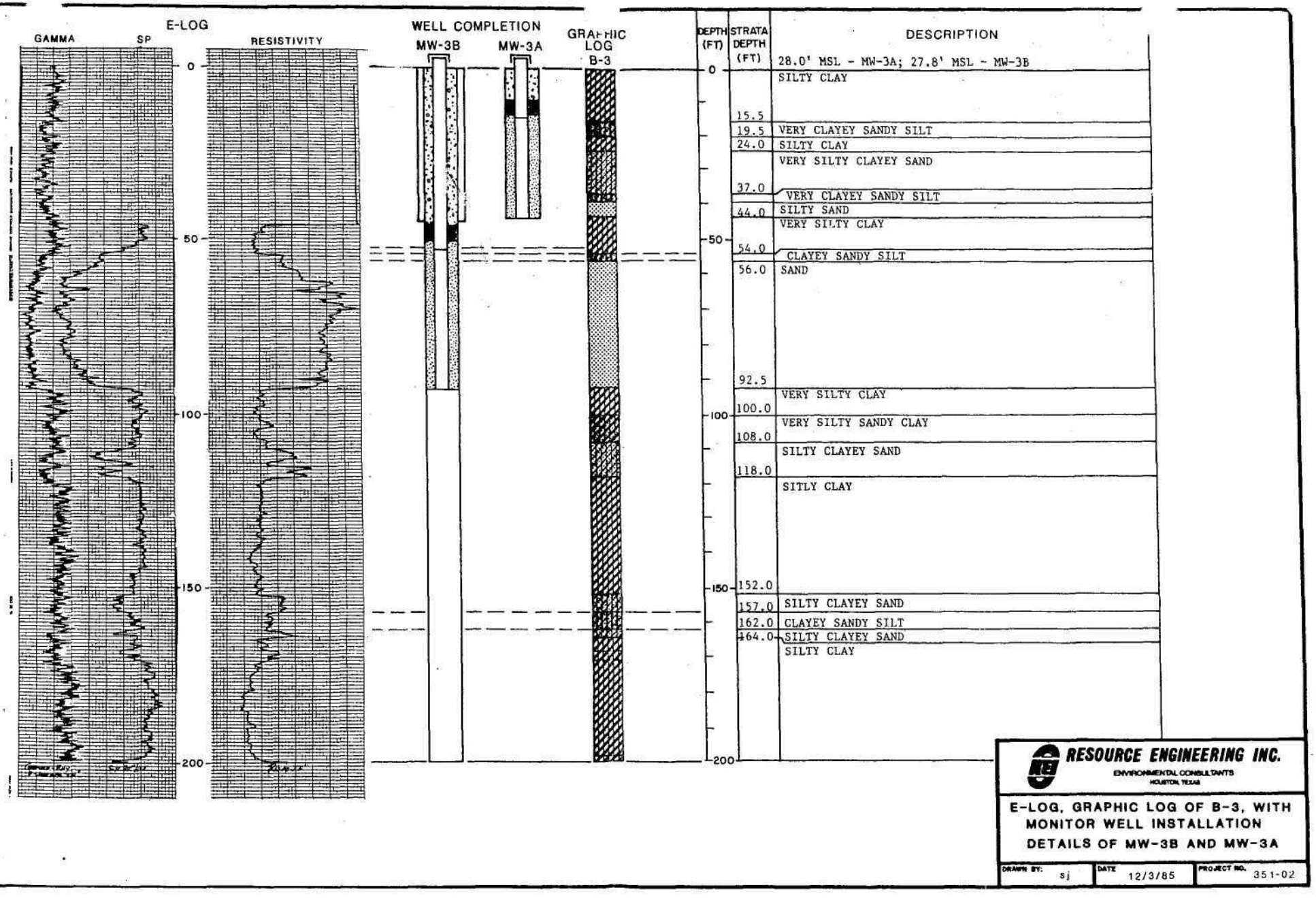
APPENDIX E

FFSZ MONITORING WELL INSTALLATION LOGS


E-LOG
GAMMA
SP
RESISTIVITY
0
50
100
150
200
WELL COMPLETION MW-1B
GR LOG B-1
DEPTH FT.
0
50
100
150
200
STRATA DEPTH (FT.)
DESCRIPTION
29.6' MSL
8.5
SILTY CLAY
12.5
CLAYEY SANDY SILT
17.0
SILTY CLAY
22.5
SAND
33.2
SILTY CLAY
41.8
CLAYEY SILT
61.5
SILTY SANDY CLAY
99.0
SAND
117.0
SILTY SANDY CLAY
131.0
SILTY CLAY
137.0
CLAYEY SILT
148.0
VERY SILTY CLAY
167.0
SILTY SANDY CLAY
170.0
CLAYEY SILT
198.0
204.0
SANDY CLAYEY SILT
RESOURCE ENGINEERING INC.
ENVIRONMENTAL CONSULTANTS
HOUSTON, TEXAS
E-LOG, GRAPHIC LOG OF B-1, WITH MONITOR WELL INSTALLATION DETAILS OF MW-1B
DRAWN BY: SJ
DATE 12/3/85
PROJECT NO. 351-02


E-LOG
GAMMA
SP
RESISTIVITY
WELL COMPLETION
MW-2B
MW-2A
B-2
DEPTH FT.
STRATA DEPTH (FT)
DESCRIPTION
27.0' MSL
SILTY CLAY
21.5
CLAYEY SANDY SILT
32.0
SILTY CLAYEY SAND
40.0
VERY SILTY SANDY CLAY
52.0
SAND
96.5
SILTY CLAY
110.0
CLAYEY SANDY SILT
118.0
SILTY CLAY
157.0
CLAYEY SANDY SILT
162.0
SILTY CLAY
200.0
BORING TERMINATED AT 200 FT.
RESOURCE ENGINEERING INC.
ENVIRONMENTAL CONSULTANTS
HOUSTON, TEXAS
E-LOG, GRAPHIC LOG OF B-2, WITH MONITOR WELL INSTALLATION DETAILS OF MW-2B AND MW-2A
DRAWN BY: sj
DATE 12/3/85
PROJECT NO. 351-02

002215



STRATA DEPTH (FT)	DESCRIPTION
	28.0' MSL - MW-3A; 27.8' MSL - MW-3B
	SILTY CLAY
15.5	
19.5	VERY CLAYEY SANDY SILT
24.0	SILTY CLAY
	VERY SILTY CLAYEY SAND
37.0	
	VERY CLAYEY SANDY SILT
44.0	SILTY SAND
	VERY SILTY CLAY
54.0	
	CLAYEY SANDY SILT
56.0	SAND
92.5	
	VERY SILTY CLAY
100.0	
	VERY SILTY SANDY CLAY
108.0	
	SILTY CLAYEY SAND
118.0	
	SITLY CLAY
152.0	
157.0	SILTY CLAYEY SAND
162.0	CLAYEY SANDY SILT
164.0	SILTY CLAYEY SAND
	SILTY CLAY

RESOURCE ENGINEERING INC.
ENVIRONMENTAL CONSULTANTS
HOUSTON, TEXAS

E-LOG, GRAPHIC LOG OF B-3, WITH MONITOR WELL INSTALLATION DETAILS OF MW-3B AND MW-3A

DRAWN BY:	DATE	PROJECT NO.
sj	12/3/85	351-02

002216

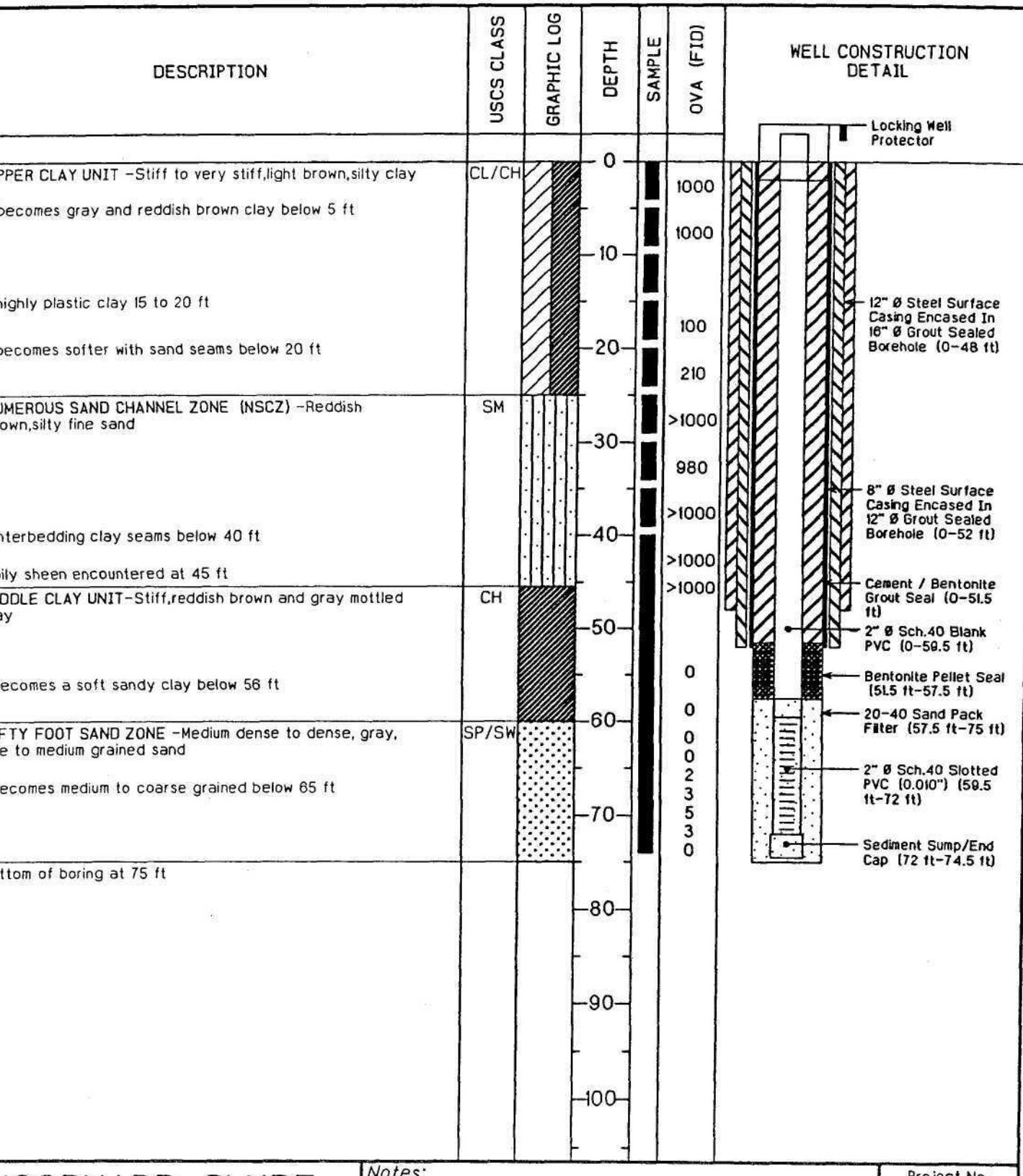
Monitoring Well No. BMW-18B

PROJECT: BRIO USGS RESPONSE PROJECT
DRILL RIG: GUS PECH-1000GPR
INITIAL GW DEPTH: ft.

DATE: 12-03-92
HOLE DIA: 8 in.
FINAL GW: ft.

LOGGED BY: CUSACK/ANDERSON
SAMPLER: 4-FT SPLIT SPOON
HOLE ELEV:

DESCRIPTION	USCS CLASS
UPPER CLAY UNIT -Stiff to very stiff,light brown,silty clay -becomes gray and reddish brown clay below 5 ft -highly plastic clay 15 to 20 ft -becomes softer with sand seams below 20 ft	CL/CH
NUMEROUS SAND CHANNEL ZONE (NSCZ) -Reddish brown,silty fine sand -interbedding clay seams below 40 ft -oily sheen encountered at 45 ft	SM
MIDDLE CLAY UNIT-Stiff,reddish brown and gray mottled clay -becomes a soft sandy clay below 56 ft	CH
FIFTY FOOT SAND ZONE -Medium dense to dense, gray, fine to medium grained sand -becomes medium to coarse grained below 65 ft	SP/SW
Bottom of boring at 75 ft	



WOODWARD-CLYDE
Environmental Consultants
Houston, Texas

Notes:

Project No.
92T317C

Page 1 of 1

002217

DMW-52B

WELL INSTALLATION LOG
NOT AVAILABLE

APPENDIX F

DNAPL RECOVERY PROGRAM (FIELD CHANGE ORDER 18)

BRIO SITE TASK FORCE
Site Office
2501 Dixie Farm Rd. • Houston, Texas 77089 • (281) 481-1261 • FAX (281) 481-0539

June 28, 2000

Mr. John Meyer
U.S. Environmental Protection Agency
Region VI, Superfund Enforcement Section
1445 Ross Avenue
Dallas, Texas 75202-2733

HAND DELIVER

BSTF/EPA-1512.00

Re: Brio - DNAPL Recovery Project
Field Change Order No. 018

Dear Mr. Meyer:

Attached is the approved Field Change Order (FCO) No. 018 to the DNAPL Recovery Project. This FCO deals with implementing the final DNAPL recovery program.

If you have any questions, please call.

Sincerely,

Lawrence E. Engle, P. E.
Project Manager

LEE:slb
Attachment

cc: S. Smith - Solutia
BSTF File

BRIO - DNAPL RECOVERY PROJECT
REQUEST FOR FIELD CHANGE ORDER

FIELD CHANGE ORDER: #018 **DATE:** June 22, 2000

TITLE: DNAPL Transition Plan

BRIEF DESCRIPTION OF CHANGE:

This FCO presents a Pit J transition plan from the current pre-cover DNAPL recovery program that has been operational for 5 years to the post-cover DNAPL recovery program. Information collected over the past several years provides the basis for this transition plan.

Summary of Post-Closure DNAPL Recovery Plan

1. Maintain the same well abandonment criteria.
2. Install thirteen (13) 2" replacement wells at existing well locations to optimize DNAPL production based on proven DNAPL recovery performance.
3. Install six (6) fully penetrating NSCZ groundwater recovery wells in the Pit J area to assist in DNAPL recovery.
4. Install suitable pumps to recover DNAPL in wells identified in 2 and 3.

Designated DNAPL Recovery Wells - Table 1 presents operational data collected from 1999 to date. The top thirteen (13) DNAPL producing wells are nos. 13, 14, 21, 22, 23, 29, 30, 31, 37, 38, 39 45 and 46. A 2" replacement well will be installed using push technology immediately adjacent to these 13 wells and at the same time as the groundwater recovery wells are installed. Figure 1 shows the locations of the 13 wells. DNAPL and groundwater from each of the 13 wells will be pumped to a collection tank (located with a building at the cover peak). The DNAPL fluids would then be transferred to the Water Treatment Plant (WTP) for separation and disposal.

Groundwater Recovery Wells - Six (6) groundwater recovery wells surrounding the Pit J area will be constructed to recover available DNAPL. The location of wells is shown in Figure 1. Specifically, these wells will be constructed to fully penetrate the NSCZ. Pumps (or pump settings) will be installed to recover DNAPL as well as groundwater.

Pumps - Existing pumps are incapable of recovering DNAPL once the site cover is installed. The use of larger diameter wells permits the use of pumps capable of extracting DNAPL from the wells. The actual pump type and pump construction materials are currently being evaluated. Candidate pumps include QED Hammerhead (pulse pump) or Blackhawk Anchor (direct displacement pump).

SUBMITTED: _____ **DATE:** 6/28/00
BRIO SITE TASK FORCE

APPROVED: _____ **DATE:** 6/28/00
U. S. EPA

	OPERATIONAL DATA								
	1999					2000			
WELL ID	Annual DNAPL Production [gal]	Average Daily DNAPL Production	Percent of Annual Production	Ranking (by %)	Ranking (Avg. Daily Prod.)	Annual DNAPL Production [gal]	Average Daily DNAPL Production	Percent of Total Production	Ranking (by %)
P6-13	**601**	**2.4**	**4%**	**9**	**9**	**214**	**3.3**	**5%**	**7**
P6-14	923	3.9	6%	5	5	112	5.9	3%	11
P6-21	817	3.2	5%	6	6	213	3.9	5%	8
P6-22	713	2.8	5%	7	7	357	5.5	9%	3
P6-23	523	2.1	3%	10	10	100	1.6	2%	12
P6-26	123	0.5	1%	19	20				
P6-27	185	0.8	1%	17	18				
P6-28	328	1.4	2%	14	14				
P6-29	**2,214**	**8.8**	**14%**	**2**	**2**	**640**	**9.6**	**15%**	**1**
P6-30	**1,681**	**6.7**	**11%**	**3**	**3**	**260**	**3.9**	**6%**	**6**
P6-31	**474**	**1.9**	**3%**	**13**	**13**	**182**	**3.0**	**4%**	**9**
P6-36	230	0.9	1%	16	17	23	0.6	1%	17
P6-37	**500**	**2**	**3%**	**11**	**11**	**181**	**2.7**	**4%**	**10**
P6-38	**2,398**	**9.5**	**15%**	**1**	**1**	**587**	**9.2**	**14%**	**2**
P6-39	**1,096**	**4.3**	**7%**	**4**	**4**	**341**	**5.2**	**8%**	**4**
P6-43**	26	1.2	0%	20	15	26	0.6	1%	16
P6-45	**615**	**2.4**	**4%**	**8**	**8**	**94**	**1.9**	**2%**	**13**
P6-46	**497**	**2**	**3%**	**12**	**12**	**285**	**4.3**	**7%**	**5**
P6-47*	**250**	**1**	**2%**	**15**	**16**	**86**	**1.4**	**2%**	**14**
P6-48*	140	0.6	1%	18	19	82	1.3	2%	15

BOLD typeface indicates continuous producing wells

Indicates DNAPL production which exceeds 1.5 gpd

* Added to continuous program in December 1999

** No longer uses an IRU

FIGURE 1

PREVIOUSLY SUBMITTED TO EPA

(D-SIZE DRAWING)

APPENDIX G

DNAPL SHIPPING AND MANIFEST PROCEDURE AND FORMS

Brio Site Task Force

Subject: **Hazardous Materials Shipping**

Effective Date: AUGUST 2003

1.0 PURPOSE

This policy describes the reasons and requirements for completing hazardous materials transportation shipping papers and identifies the method to accomplish the task.

1.1 The Hazardous Waste Manifest System is a set of forms, reports, and procedures designed to seamlessly track hazardous waste from the time it leaves the generator facility where it was produced, until it reaches the off-site waste management facility that will store, treat, or dispose of the hazardous waste. The system allows the waste generator to verify that its waste has been properly delivered, and that no waste has been lost or unaccounted for in the process.

1.2 The key component of this system is the Uniform Hazardous Waste Manifest which is a form prepared by all generators who transport, or offer for transport, hazardous waste for off-site treatment, recycling, storage, or disposal. Currently, the manifest is a paper document containing multiple copies of a single form. When completed, it contains information on the type and quantity of the waste being transported, instructions for handling the waste, and signature lines for all parties involved in the disposal process. The manifest is required by the Department of Transportation (DOT), the Environmental Protection Agency (EPA), and the State of Texas. Each party that handles the waste signs the manifest and retains a copy. This ensures critical accountability in the transportation and disposal processes. Once the waste reaches its destination, the receiving facility returns a signed copy of the manifest to the generator, confirming that the waste has been received by the designated facility. (See attachment 1 for manifest routing.)

1.3 The current Hazardous Waste Manifest is a joint undertaking by the EPA, the DOT, and the state of Texas. The EPA is responsible for regulating hazardous waste under a Federal statute known as the Resource Conservation and Recovery Act (RCRA). This Act requires that all hazardous waste shipped off-site be tracked from "cradle-to-grave" using a manifest that provides information about the generator of the waste, the facility that will receive the waste, a description and quantity of the waste (including the number and type of containers), and how the waste will be routed to the receiving facility. Because hazardous waste is also regulated by the DOT under its hazardous

materials laws, the Manifest was developed to meet both EPA's requirements for a manifest, and DOT's requirements for "shipping papers.

2.0 SCOPE

This policy applies to all Brio Site Task Force hazardous waste shipments. The DOT is responsible for regulating and enforcing the regulations, published in the Code of Federal Regulations, (CFR) 49, which governs the transportation of hazardous materials in the United States. This SOP can not detail each and every requirement which may apply. For more detailed information, consult the applicable regulations.

3.0 DEFINITIONS

Competent person: An employee who is trained and capable of identifying the appropriate specific form to use as prescribed by the DOT and the EPA as-well-as the hazard class, proper shipping name, identification number, and packing group number.

Qualifications of competent persons must be documented in writing. The DOT specifies that employers must ensure that employees engaged in hazardous materials shipping are trained to a level of General Awareness about the DOT hazardous materials regulations which govern the classification, identification and shipping of hazardous materials the employee may encounter in their job. Familiarization training must occur every two (2) years.

4.0 REQUIREMENTS

In preparing a hazardous material for transportation it is the shipper's responsibility to properly classify the material according to criteria established by the DOT, 49 CFR 172.101, 173.121,173.150 (b) (2), and the EPA, 40 CFR 261 and 262.

4.1 Responsibilities:

4.1.1 A generator who transports, or offers for transportation, hazardous waste for off-site management, prepares a Uniform Hazardous Waste Manifest form, TCEQ form 0311 (Rev. 09/01/02) or the most recent revised form, following the instructions included in this SOP, CFR 40, and 49 as well as the profile (the properties and composition of material that make up the stream ID) description provided for Dense Non-Aqueous Phase Liquid (DNAPL) as

assessed from sampling and agreed upon with the incineration facility.

4.1.2 A competent person shall classify and assign the appropriate coding for shipments on the Uniform Hazardous Waste Manifest (See Attachment #2 for an example of the Uniform Hazardous Waste Manifest form) in accordance with 49 CFR 172.101, 173.121, 173.150 (b) (2), and the EPA, 40 CFR 261, 262, and appropriate profile data assigned by sampling.

4.1.2.1 The Competent Person also must complete a Land Disposal Restrictions (LDR) form to be sent along with the Uniform Hazardous Waste Manifest to the disposal facility. The LDR (See Attachment 3 example form provided by a disposal facility) is required by 40 CFR 268.7(a) and must have the appropriate fields completed for the waste being transported.

4.1.2.2 The Brio Site Safety and Operations Supervisor (SOS) signs the manifest certification by hand, and obtains the handwritten signature of the initial transporter and date of acceptance on the manifest. The site retains one copy and gives the transporter the remaining copies of the manifest.

4.1.2.3 The Brio Site is required by the State to send a copy of the manifest (signed by both the generator and the transporter) to the State TCEQ. The TCEQ enters all information submitted by industrial and hazardous waste transporters, receivers, generators and one time shipments into a database that tracks industrial and hazardous waste generation and management activities in the State of Texas.

4.1.2.4 The Brio Site must keep a copy of each signed manifest for three years, or until it receives a signed copy from the disposal facility which ultimately receives the waste. A copy must be kept in the site files for 30 years.

4.1.3 When the transporter arrives at the treatment, storage, and disposal facility designated on the manifest, he gives the manifest to a representative of that facility who signs and dates the manifest. The transporter keeps a signed copy of this manifest on file.

4.1.4 Any discrepancies between the waste description on the manifest and the actual waste received by the disposal facility are noted in the "Discrepancy Indication Space" on the manifest.

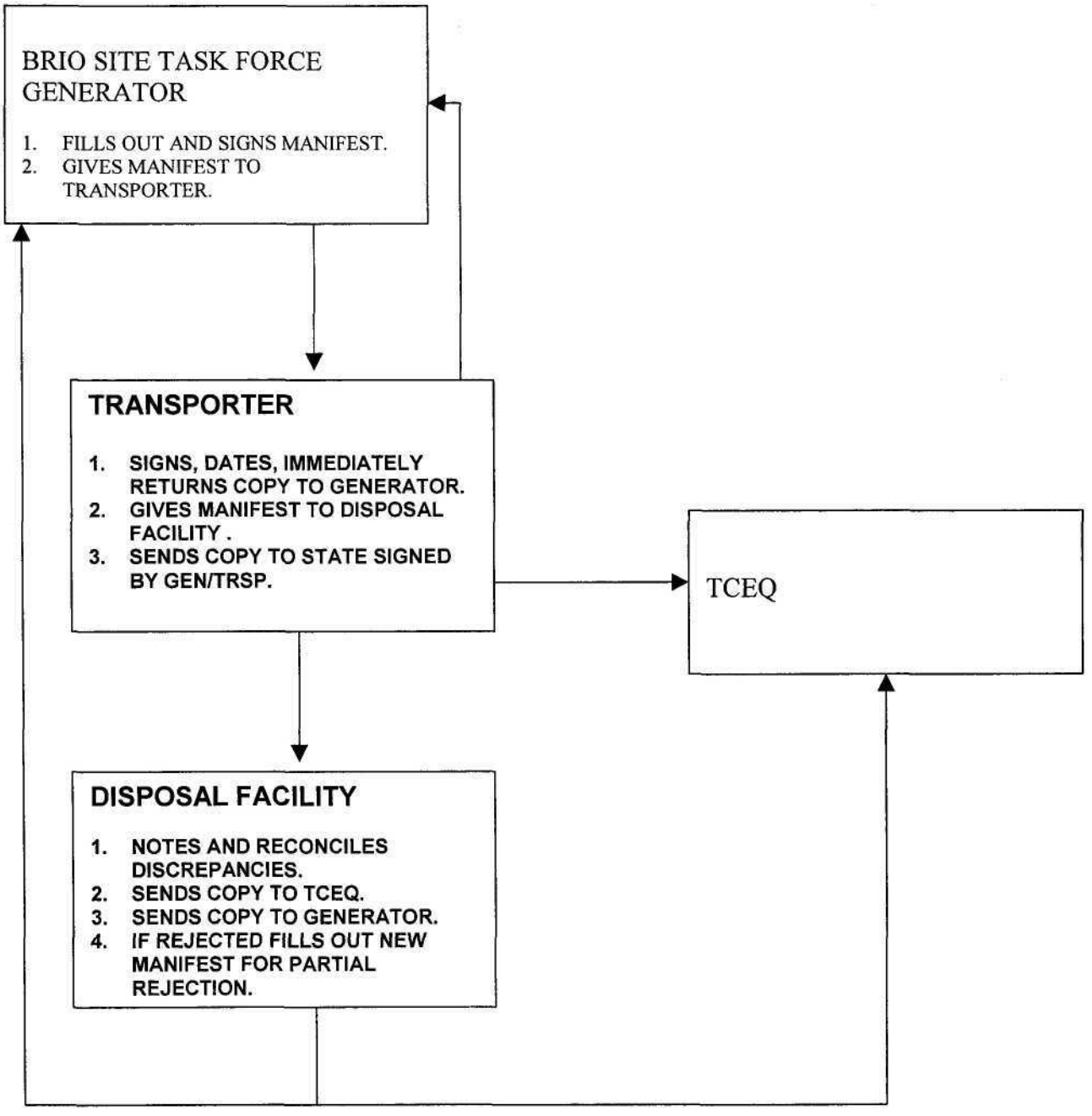
4.1.5 The disposal facility sends a copy of the manifest, signed by their representative, to the generator, thereby closing the loop in the manifest cycle and enabling the generator to verify that the waste has been disposed of properly. The disposal facility also retains a copy of the manifest on file.

4.1.6 If the Brio Site has not received a copy back from the disposal facility within thirty (30) days of the shipment, call the facility and request the copy.

If the Brio Site does not receive a copy of the manifest signed by the disposal facility within 45 days of the date that the waste was accepted by the initial transporter, the Brio Site must file an exception report (Section CFR 40, part 262.42).

ATTACHMENT 1

MANIFEST ROUTING



BRIO SITE TASK FORCE
MAINTENANCE, OPERATIONS, AND MONITORING PLAN

ATTACHMENT 2
UNIFORM HAZARDOUS WASTE MANIFEST FORM

TEXAS NATURAL RESOURCE
CONSERVATION COMMISSION
P.O. Box 13087
Austin, Texas 78711-3087

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

SAMPLE COPY

Form approved. OMB No. 2050-0039.

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator's US EPA ID No. TXD980625453 Manifest Document No. 02520441	2. Page 1 of 1	Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address: BRIO SITE TASK FORCE: ATTN, YOUR NAME 2501 DIXIE FARM RD. HOUSTON, TX. 77088 4. Generator's Phone (800) 392-1664	A. State Manifest Document Number: 02520441 B. State Generator's ID: 36844
5. Transporter 1 Company Name: CLEAN HARBORS ENV. SERVICES 6. US EPA ID Number: MAD039322250	C. State Transporter's ID: 41315 D. Transporter's Phone: (781) 849-1800
7. Transporter 2 Company Name 8. US EPA ID Number	E. State Transporter's ID: F. Transporter's Phone:
9. Designated Facility Name and Site Address: CLEAN HARBORS DEER PARK LP 2027 BATTLEGROUND RD. DEER PARK, TX. 77536 10. US EPA ID Number: TXD055141378	G. State Facility's ID: 50089 H. Facility's Phone: 281-930-2300

11A. HM	11. US DOT Description (including Proper Shipping Name, Hazard Class, ID Number and Packing Group)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	Waste No.
	a. RQ. HAZARDOUS WASTE FLAMMABLE LIQUID, N.O.S. 3, UN1993, PGII, (VINYL CHLORIDE)	1	TT	EST.	P	D001/219H
	b.					
	c.					
	d.					

J. Additional Descriptions for Materials Listed Above	K. Handling Codes for Wastes Listed Above
EPA WASTE CODE D001, D018, D029, D039, D040, D043 HO 78231-125 (CNAPL)	MO-41

15. Special Handling Instructions and Additional Information
IN CASE OF EMERGENCY CONTACT: BRIO 281-481-1261
CLEAN HARBORS 781-849-1800

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packaged, marked, and labelled/placarded, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations, including applicable state regulations.
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

GENERATOR

Printed/Typed Name	Signature	Month Day Year

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials — Date

Printed/Typed Name	Signature	Month Day Year

18. Transporter 2 Acknowledgement of Receipt of Materials — Date

Printed/Typed Name	Signature	Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19. — Date

Printed/Typed Name	Signature	Month Day Year

(Rev. 07/01/97) White - original Pink-TSD Facility Yellow-Transporter Green-Generator's first copy

ATTACHMENT 3

LAND DISPOSAL RESTRICTIONS FORM

LDR NOTIFICATION PACKAGE

General Instructions

The enclosed Land Disposal Restrictions (LDR) Notification Form has been designed to streamline the LDR notification & certification requirements while complying with 40 CFR §268.7. For restricted *waste not meeting applicable treatment standards* of 40 CFR Part 268 Subpart D, the proper completion of the enclosed one page notification form will satisfy the LDR notification & certification requirements. This form will also accommodate contaminated soil that meets the alternative treatment standards of §268.49. However, if your *waste already meets treatment standards (other than contaminated soil), please contact your SK representative for the form "Notification & Certification: Restricted Waste Meeting Treatment Standards".*

Please type or print in ink & ***retain a copy of this entire package for your files.*** *Note: The LDR Notification Package is also available in an electronic format utilizing Windows 95, Word 7.0 template fill-in feature. Please contact your SK Representative for a diskette.*

LDR Notification Form

Generator Name & Manifest No.: Enter the Generator Company's Name & Manifest No. applicable to the LDR Notification Form.

A. General Waste Notification

SK Profile No.: Enter the SK Material Profile No. assigned to the waste (one per Form Line No. only). *Note: Form Line No. refers to the LDR Notification Form, not the hazardous waste manifest line item number.*

EPA Waste Codes & LDR Subcategories (if any): Per SK Profile No., list all EPA waste codes & LDR subcategories (if any) applicable to the waste. Use Attachment 1 if there are space constraints due to numerous waste codes. *The below subcategory legend is offered as an option to writing the words.* ***Note: If you choose to use the subcategory legend, please retain a copy of these instructions for your files.***

The following waste codes have subcategories: D001 ICW, D001 LQ, D003 EX, D003 UO, D003 RC, D003 RS, D003 OR, D003 WR, D006 CB, D008 LB, D009 LM NRR, D009 LM-RR, D009 HM (organic), D009 HM (inorganic), K006 AN, K006 HY, K069 CS, K069 NCS, K071 RR, K071 NRR, K106 LM-RR, K106 LM-NRR, K106 HM, P065 LM-RR, P065 LM-IR, P065-NIRR, P065 HM-IRR, P092-NIRR, P092 LM-RR, P092 LM-IR, P092 HM-IRR, U151 LM-RR, U151 LM-NRR, U151 HM.

SUBCATEGORY LEGEND

AN = Anhydrous	IR = INCIN Residues	NRR = Non-RMERC Residues
CB = Cadmium Battery	IRR = INCIN or RMERC Residues	OR = Other Reactives [40 §CFR 261.23(a)(1)]
CS = Calcium Sulfate	LB = Lead Acid Battery	RC = Reactive Cyanide [40 §CFR 261.23(a)(5)]
EX = Explosive *	LM = Low Mercury (<260 mg/kg)	RR = RMERC Residues
HM = High Mercury (>260 mg/kg)	LQ = Liquid ≥ 10% TOC	RS = Reactive Sulfide [40 §CFR 261.23(a)(5)]
HY = Hydrated	NCS = Non-Calcium Sulfate	TOC = Total Organic Carbon
ICW = Ignitable Characteristic Waste	NIRR = Non-Incineration or non-RMERC Residues	UO = Unexploded Ordnance
		WR = Water Reactive

* Subcategory based on 40 CFR §261.23(a)(6), (7), & (8)

NWW or WW: Check either non-wastewater or wastewater, if the waste is not subject to Sections B or D. *Note: Wastewater means < 1% TOC and < 1% Total Suspended Solids. Non-wastewater means not a wastewater.*

Waste Constituent Notification: Check the "None" box if the waste is not subject to waste constituent notification. *Note: For labpacks subject to the alternative treatment standards of* 40 CFR §268.42(c) , *i.e., incineration, waste constituent notification does not apply.* For waste subject to waste constituent notification, list the *Legend Constituent #* or use Attachment 2 if additional space is needed. *EPA Hazardous Wastes subject to waste constituent notification are as follows:* D001 ICW (ignitable characteristic waste), D002, D003 EX (explosive), D003 OR (other reactives), D003 WR (water reactive), D004-D043, F001-F005, & F039.

Waste constituent notification identifies "constituents of concern" in F001-F005 & F039 wastes. For the characteristic codes listed above, the notification identifies "underlying hazardous constituents", i.e., any constituent listed in 40 CFR §268.48, Universal Treatment Standards (UTS), *except fluoride, selenium, sulfides, vanadium & zinc* which can reasonably be expected to be present at the point of generation of the hazardous waste at a concentration above the constituent-specific UTS level.

Instructions Continue On Next Page ☞

LDR 1/7

LDR NOTIFICATION INSTRUCTIONS (continued):

B. Hazardous Debris Notification

Hazardous Debris Notification: *In addition to the completion of Section A(except NWW or WW)*, check all the boxes in Section B that apply & indicate the applicable Form Line No. from Section A if the waste will be treated with the alternative treatment technologies & meets the following definition: *hazardous debris* means debris that contains a hazardous waste listed in Subpart D of 40 CFR Part 261 or exhibits a *characteristic* of hazardous waste identified in Subpart C of 40 CFR Part 261; *debris* means solid material exceeding a 60 mm particle size that is intended for disposal & that is: a manufactured object; or plant or animal matter; or natural geologic material. However, the following materials are not debris: any material for which a specific treatment standard is provided in Subpart D, Part 268, namely lead acid batteries, cadmium batteries, & radioactive lead solids; process residuals such as smelter slag & residues from the treatment of waste, wastewater, sludges, or air emission residues; & intact containers of hazardous waste that are not ruptured & that retain at least 75% of their original volume. A mixture of debris that has not been treated to the standards provided by §268.45 & other material is subject to regulation as debris if the mixture is comprised primarily of debris, by volume, based on visual inspection.

The *alternative* treatment standards for hazardous debris (40 CFR §268.45) allow the use of specific technologies from one or more of the following categories: extraction, destruction, or immobilization. These alternatives were developed due to the impracticality of sampling debris > 60mm particle size (~2.5 inches); therefore, meeting concentration-based treatment standards is also impractical.

C. Contaminated Soil Notification & Certification

Contaminated Soil Notification: *In addition to the completion of Section A,* check the box provided in Section C & indicate the applicable Form Line No. from Section A if the waste meets the following definition & will be treated in accordance with or complies with the alternative soil treatment standards: unconsolidated earth material composing the superficial geologic strata (material overlying bedrock), consisting of clay, silt, sand, or gravel size particles as classified by the U.S. Soil Conservation Service, or a mixture of such materials with liquids, sludges or solids which is inseparable by simple mechanical removal processes & is made up primarily of soil by volume based on visual inspection.

The *alternative* treatment standard for listed/characteristic contaminated soils is a reduction in concentration of each hazardous constituent subject to treatment by 90% or to 10 times Universal Treatment Standards (UTS), i.e., "90% capped @ 10x UTS". Constituents subject to treatment are any constituents listed in 40 CFR §268.48, UTS Table (except fluoride, selenium, sulfides, vanadium & zinc) that are present at concentrations >10 times UTS. If these standards are used, the soil remains subject to RCRA Subtitle C.

D. Lab Pack (Incineration) Notification & Certification

Lab Pack (Incineration) Notification: *In addition to the completion of Section A (except NWW, WW & Waste Constituent Notification),* check the box provided in Section D & indicate the applicable Form Line No. from Section A if the lab pack meets the following criteria: 1) Contains only wastes that have not been excluded under Appendix IV to 40 CFR Part 268. These excluded wastes are as follows: D009, F019, K003, K004, K005, K006, K062, K071, K100, K106, P010, P011, P012, P076, P078, U134, U151; 2) Meets DOTs lab pack definition under 49 CFR 173.12; 3) Is sent to a combustion facility in compliance with the alternative treatment standards for lab packs under 40 CFR §268.42(c). EPAs alternative treatment standard for these wastes is CMBST (combustion). This negates the requirements to monitor for, or comply with, the universal treatment standards for underlying hazardous constituents / constituents of concern.

Note: If any of the excluded wastes listed above are packaged as a lab pack, they will be subject to the applicable LDR treatment standard as a NWW or WW. Some of these wastes have a recovery (technology-based) treatment standard, while others have only metal (concentration based) standards that can likely be met by the landfills.

E. Extensions & Variances

Extensions & Variances: *In addition to the completion of Section A,* check the box provided in Section E & indicate the applicable Form Line No. from Section A if the waste is subject to a deadline extension or variance. Describe in the space provided in Section E any extension or variance that applies to the waste & include applicable dates.

LDR Attachment 1: EPA Waste Codes

Attachment 1: *This form is only used if additional space is required to enter EPA waste codes in Section A of the LDR Notification form.* If Attachment 1 is used, enter the Form Line No. from Section A of the notification form next to the applicable waste codes.

LDR Attachment 2: Waste Constituent Notification

Attachment 2: *This form is only used if additional space is required to enter constituents in Section A of the LDR Notification form.* If Attachment 2 is used, enter the Form Line No. from Section A of the notification form next to the applicable constituents.

LDR NOTIFICATION FORM

Generator Name _____ **Manifest No.** _____

Pursuant to 40 CFR §268.7(a), I hereby notify that this shipment contains waste restricted under 40 CFR Part 268 Land Disposal Restrictions (LDR).

A. GENERAL WASTE NOTIFICATION

Form Line No.	SK Profile No.	EPA Waste Codes & LDR Subcategories (if any) *List codes or use Attachment 1*	NWW	WW	Waste Constituent Notification *Check the "None" box or List Legend Constituent # or use Attachment 2*
1		_____ _____ ☐ Check if Attachment 1 has been used	☐	☐	_____ _____ ☐ None ☐ Check if Attachment 2 has been used
2		_____ _____ ☐ Check if Attachment 1 has been used	☐	☐	_____ _____ ☐ None ☐ Check if Attachment 2 has been used
3		_____ _____ ☐ Check if Attachment 1 has been used	☐	☐	_____ _____ ☐ None ☐ Check if Attachment 2 has been used
4		_____ _____ ☐ Check if Attachment 1 has been used	☐	☐	_____ _____ ☐ None ☐ Check if Attachment 2 has been used
5		_____ _____ ☐ Check if Attachment 1 has been used	☐	☐	_____ _____ ☐ None ☐ Check if Attachment 2 has been used
6		_____ _____ ☐ Check if Attachment 1 has been used	☐	☐	_____ _____ ☐ None ☐ Check if Attachment 2 has been used

B. HAZARDOUS DEBRIS NOTIFICATION

☐ This hazardous debris, as identified above on Line No(s). _____ is subject to the alternative treatment standards of 40 CFR §268.45.
The waste contains the following contaminants subject to treatment (check all that apply):
☐ Toxicity characteristic debris ☐ Debris contaminated with listed waste ☐ Cyanide reactive debris

C. CONTAMINATED SOIL NOTIFICATION & CERTIFICATION

☐ This contaminated soil, as identified above on Line No(s). _____ is subject to the alternative treatment standards of 40 CFR §268.49(c).
Complete the following: "I certify under penalty of law that I personally have examined this contaminated soil & it [☐ does/ ☐ does not] contain listed hazardous waste & [☐ does / ☐ does not] exhibit a characteristic of hazardous waste & [☐ is subject to / ☐ complies with] soil treatment standards as provided by §268.49(c) or the universal treatment standards". *Note: Constituents subject to treatment are any constituents listed in 40 CFR §268.48 Universal Treatment Standards that are reasonably expected to be present in any given volume of contaminated soil, except fluoride, selenium, sulfides, vanadium & zinc, & are present at concentrations greater than ten times the universal treatment standard.*

D. LAB PACK (INCINERATION) NOTIFICATION & CERTIFICATION

☐ This lab pack, as identified above on Line No(s). _____ is subject to the alternative treatment standards of 40 CFR §268.42(c).
"I certify under penalty of law that I personally have examined & am familiar with the waste & that the lab pack contains only wastes that have not been excluded under Appendix IV to 40 CFR Part 268 & that this lab pack will be sent to a combustion facility in compliance with the alternative treatment standards for lab packs at 40 CFR §268.42(c). I am aware that there are significant penalties for submitting a false certification, including the possibility of fine or imprisonment".

E. EXTENSIONS & VARIANCES

☐ This waste, as identified above on Line No(s). _____ is not prohibited from land disposal & is subject to a deadline extension or variance, e.g., treatability variance, case-by-case extension. *Describe below any extension or variance that applies to this waste & include applicable dates:*

Generator's Authorized Signature	Name & Title (Printed or Typed)	Date
_____	_____	_____ / _____ / _____

DWALKER.LDR.NOTIFICATION.12.02.98

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002235

LDR ATTACHMENT 1: EPA WASTE CODE LISTING

Note: If this form is necessary for notification purposes, it must be used in conjunction with the Notification form and/or Certification form.

Generator Name _____ **Manifest No.** _____

Line #'s	EPA Code	Line #'s	EPA Code	Line #'s	EPA Code	Line #'s	EPA Code	Line #'s	EPA Code	Line #'s	EPA Code
"D" Characteristic Codes											
	D001 ICW		D004		D009 HM (Organic)		D017		D026		D035
	D001 LQ (≥10% TOC)		D005		D009 HM (Inorganic)		D018		D027		D036
	D002		D006		D010		D019		D028		D037
	D0003 EX		D006 CB		D011		D020		D029		D038
	D0003 OR		D007		D012		D021		D030		D039
	D0003 RC		D008		D013		D022		D031		D040
	D0003 RS		D008 LB		D014		D023		D032		D041
	D0003 UO		D009 LM-NRR		D015		D024		D033		D042
	D0003 WR		D009 LM-RR		D016		D025		D034		D043
"F" Listed Codes											
	F001		F006		F011		F022		F027		F037
	F002		F007		F012		F023		F028		F038
	F003		F008		F019		F024		F032		F039
	F004		F009		F020		F025		F034		
	F005		F010		F021		F026		F035		
"K" Listed Codes											
	K001		K022		K043		K086		K109		K144
	K002		K023		K044		K087		K110		K145
	K003		K024		K045		K088		K111		K147
	K004		K025		K046		K093		K112		K148
	K005		K026		K047		K094		K113		K149
	K006 AN		K027		K048		K095		K114		K150
	K006 HY		K028		K049		K096		K115		K151
	K007		K029		K050		K097		K116		K156
	K008		K030		K051		K098		K117		K157
	K009		K031		K052		K099		K118		K158
	K010		K032		K060		K100		K123		K159
	K011		K033		K061		K101		K124		K161
	K013		K034		K062		K102		K125		K169
	K014		K035		K069 CS		K103		K126		K170
	K015		K036		K069 NCS		K104		K131		K171
	K016		K037		K071 RR		K105		K132		K172
	K017		K038		K071 NRR		K106 LM-RR		K136		
	K018		K039		K073		K106 LM-NRR		K140		
	K019		K040		K083		K106 HM		K141		
	K020		K041		K084		K107		K142		
	K021		K042		K085		K108		K143		
"P" Listed Codes											
	P001		P013		P027		P041		P056		P066
	P002		P014		P028		P042		P057		P067
	P003		P015		P029		P043		P058		P068
	P004		P016		P030		P044		P059		P069
	P005		P017		P031		P045		P060		P070
	P006		P018		P033		P046		P062		P071
	P007		P020		P034		P047		P063		P072
	P008		P021		P036		P048		P064		P073
	P009		P122		P037		P049		P065 NIRR		
	P010		P023		P038		P050		P065 LM-IR		
	P011		P024		P039		P051		P065 LM-RR		
	P012		P026		P040		P054		P065 HM-IRR		

Note: The Line #'s are from the Notification Form, not the hazardous waste manifest.

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LDR ATTACHMENT 1: EPA WASTE CODE LISTING - PAGE 2 MANIFEST NO.:

Line #'s	EPA Code	Line #'s	EPA Code	Line #'s	EPA Code	Line #'s	EPA Code	Line #'s	EPA Code	Line #'s	EPA Code
"P" Characteristic Codes											
	P074		P089		P099		P112		P127		P198
	P075		P092 NIRR		P101		P113		P128		P199
	P076		P092 LM-IR		P102		P114		P185		P201
	P077		P092 LM-RR		P103		P115		P188		P202
	P078		P092 HM-IRR		P104		P116		P189		P203
	P081		P093		P105		P118		P190		P204
	P082		P094		P106		P119		P191		P205
	P084		P095		P108		P120		P192		
	P085		P096		P109		P121		P194		
	P087		P097		P110		P122		P196		
	P088		P098		P111		P123		P197		
"U" Listed Codes											
	U001		U045		U089		U133		U174		U221
	U002		U046		U090		U134		U176		U222
	U003		U047		U091		U135		U177		U223
	U004		U048		U092		U136		U178		U225
	U005		U049		U093		U137		U179		U226
	U006		U050		U094		U138		U180		U227
	U007		U051		U095		U140		U181		U228
	U008		U052		U096		U141		U182		U234
	U009		U053		U097		U142		U183		U235
	U010		U055		U098		U143		U184		U236
	U011		U056		U099		U144		U185		U237
	U012		U057		U101		U145		U186		U238
	U014		U058		U102		U146		U187		U239
	U015		U059		U103		U147		U188		U240 (2,4-D)
	U016		U060		U105		U148		U189		U240 (2,4-D) Salts
	U017		U061		U106		U149		U190		U243
	U018		U062		U107		U150		U191		U244
	U019		U063		U108		U151 LM-NRR		U192		U246
	U020		U064		U109		U151 LM-RR		U193		U247
	U021		U066		U110		U151 HM		U194		U248
	U022		U067		U111		U152		U196		U249
	U023		U068		U112		U153		U197		U271
	U024		U069		U113		U154		U200		U278
	U025		U070		U114		U155		U201		U279
	U026		U071		U115		U156		U202		U280
	U027		U072		U116		U157		U203		U328
	U028		U073		U117		U158		U204		U353
	U029		U074		U118		U159		U205		U359
	U030		U075		U119		U160		U206		U364
	U031		U076		U120		U161		U207		U367
	U032		U077		U121		U162		U208		U372
	U033		U078		U122		U163		U209		U373
	U034		U079		U123		U164		U210		U387
	U035		U080		U124		U165		U211		U389
	U036		U081		U125		U166		U213		U394
	U037		U082		U126		U167		U214		U395
	U038		U083		U127		U168		U215		U404
	U039		U084		U128		U169		U216		U408
	U041		U085		U129		U170		U217		U409
	U042		U086		U130		U171		U218		U410
	U043		U087		U131		U172		U219		U411
	U044		U088		U132		U173		U220		

Note: The Line #'s are from the Notification Form, not the hazardous waste manifest.

DWALKER.LDR 1.02.03.99

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LDR ATTACHMENT 2: WASTE CONSTITUENT NOTIFICATION

Note: If this form is necessary for notification purposes, it must be used in conjunction with the Notification form and/or Certification form.

Generator Name _____ **Manifest No.** _____

LDR Inorganic Constituents (40 CFR §268.48)

Line #'s	Constituent	Legend #	Line #'s	Constituent	Legend #	Line #'s	Constituent	Legend #
	Antimony	246		Cyanides (Total)	252		Nickel	258
	Arsenic	247		Cyanides (Amenable)	253		Selenium[1]	259
	Barium	248		Fluoride[1]	254		Silver	260
	Beryllium	249		Lead	255		Sulfide[1]	261
	Cadmium	250		Mercury - NWW from Retort	256		Thallium	262
	Chromium (Total)	251		Mercury - All Others	257		Vanadium[1]	263

LDR Inorganic Constituents (40 CFR §268.48)

Line #'s	Constituent	Legend #	Line #'s	Constituent	Legend #	Line #'s	Constituent	Legend #
	Acenaphthylene	49		2-sec-Butyl-4,6- dinitrophenol (Dinoseb)	79		o,p'-DDT	112
	Acenaphthene	50		Carbaryl *	270		p,p'-DDT	113
	Acetone	51		Carbenzadim *	271		Dibenz(a,h)anthracene	114
	Acetonitrile	52		Carbofuran *	272		Dibenz(a,e)pyrene	115
	Acetophenone	53		Carbofuran phenol *	273		1,2-Dibromo-3-chloropropane	104
	2-Acetylaminofluorene	54		Carbon disulfide	80		1,2-Dibromoethane (Ethylene dibromide)	105
	Acrolein	55		Carbon tetrachloride	81		Dibromomethane	106
	Acrylamide *	56		Carbosulfan *	274		m-Dichlorobenzene	116
	Acrylonitrile	57		Chlordane (alpha & gamma isomers)	82		o-Dichlorobenzene	117
	Aldicarb sulfone *	265		p-Chloroaniline	83		p-Dichlorobenzene	118
	Aldrin	58		Chlorobenzene	84		Dichlorodifluoromethane	119
	4-Aminobiphenyl	59		Chlorobenzilate	85		1,1-Dichloroethane	120
	Aniline	60		2-Chloro-1,3-butadiene	86		1,2-Dichloroethane	121
	Anthracene	61		Chlorodibromomethane	87		1,1-Dichloroethylene	122
	Aramite	62		Chloroethane	88		trans-1,2-Dichloroethylene	123
	Barban *	266		bis(2- Chloroethoxy) methane	89		2,4-Dichlorophenol	124
	Bendiocarb *	267		bis(2-Chloroehtyl)ether	90		2,6-Dichlorophenol	125
	Benomyl *	268		2-Chloroethyl vinyl ether *	94		2,4-D (2,4-Dichlorophenoxy-acetic acid	107
	Benz(a)anthracene	68		Chloroform	91		1,2-Dichloropropane	126
	Benzal chloride *	69		bis(2-Chloroisopropyl)ether	92		cis-1,3-Dichloropropylene	127
	Benzene	67		p-Chloro-m-cresol	93		trans-1,3-Dichloropropylene	128
	Benzo(b)fluoranthene	70		Chloromethane (Methyl chloride)	95		Dieldrin	129
	Benzo(k) fluoranthene	71		2-Chloronaphthalene	96		Diethylphthalate	130
	Benzo(g,h,i) fluoranthene	72		2-Chlorophenol	97		p-Dimethylaminoazobenzene *	140
	Benzo(a)pyrene	73		3-Chloropropylene	98		2-4-Dimethyl phenol	131
	alpha-BHC	63		Chrysene	99		Dimethyl phthalate	132
	beta-BHC	64		o-Cresol	100		Di-n-butyl phthalate	133
	delta-BHC	65		m-Cresol	101		1,4-Dinitrobenzene	134
	gamma-BHC	66		p-Cresol	102		4,6-Dinitro-o-cresol	135
	Bromodichloromethane	74		m-Cumenyl methylcarbamate *	275		2,4-Dinitrophenol	136
	Bromomethane (methyl bromide)	75		Cyclohexanone	103		2,4-Dinitrotoluene	137
	4-Bromophenyl phenyl ether	76		o,p'-DDD	108		2,6-Dinitrotoluene	138
	n-Butyl alcohol	77		p,p'-DDD	109		Di-n-octyl phthalate	139
	Butyl benzyl phthalate	78		o,p'-DDE	110		Di-n-propylnitrosamine	141
	Butylate *	269		p,p'-DDE	111		1,4-Dioxane	142

[1] *Regulated under F039 only; not a UHC* * *Constituent not regulated under F039* *Note: Line # 's are from the Notification Form, not the hazardous waste manifest.*

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LDR ATTACHMENT 2: WASTE CONSTITUENT NOTIFICATION - PAGE 2 MANIFEST NO.: _____

Line #'s	Constituent	Legend #
_____	Diphenylamine	143
_____	Diphenylnitrosamine	144
_____	1,2-Diphenylhydrazine	145
_____	Disulfoton	146
_____	Dithiocarbamates (total) *	276
_____	Endosulfan I	147
_____	Endosulfan II	148
_____	Endosulfan sulfate	149
_____	Endrin	150
_____	Endrin aldehyde	151
_____	EPTC	277
_____	2-Ethoxyethanol **	32
_____	Ethyl acetate	152
_____	Ethyl benzene	154
_____	Ethyl cyanide	153
_____	Ethyl ether	155
_____	Ethyl methacrylate	157
_____	Ethylene oxide	158
_____	bis(2-Ethylhexyl)phthalate	156
_____	Famphur	159
_____	Fluoranthene	160
_____	Fluorene	161
_____	Formetanate hydrochloride *	278
_____	Heptachlor	162
_____	Heptachlor epoxide	163
_____	Hexachlorobenzene	164
_____	Hexachlorobutadiene	165
_____	Hexachlorocyclopentadiene	166
_____	Hexachloroethane	169
_____	Hexachloropropylene	170
_____	HxCDDs (All Hexachloro-dibenzo-p-dioxins)	167
_____	HxCDFs (All Hexachloro-dibenzofurans)	168
_____	Indeno (1,2,3-c,d) pyrene	171
_____	Iodomethane	172
_____	Isobutyl alcohol	173
_____	Isodrin	174
_____	Isosafrole	175
_____	Kepone	176
_____	Methacrylonitrile	177
_____	Methanol	178
_____	Methapyrilene	179
_____	Methiocarb *	279
_____	Methomyl *	280
_____	Methoxychlor	180

Line #'s	Constituent	Legend #
_____	Methyl ethyl ketone	184
_____	Methyl isobutyl ketone	185
_____	Methyl methacrylate	186
_____	Methyl methansulfonate	187
_____	Methyl parathion	188
_____	3-Methylcholanthrene	181
_____	4,4-Methylene bis (2-chloro-aniline)	182
_____	Methylene chloride	183
_____	Metolcarb *	281
_____	Mexacarbate *	282
_____	Molinate *	283
_____	Naphthalene	189
_____	2-Naphthylamine	190
_____	o-Nitroaniline *	191
_____	p-Nitroaniline	192
_____	Nitrobenzene	193
_____	5-Nitro-o-toluidine	194
_____	o-Nitrophenol *	195
_____	p-Nitrophenol	196
_____	2-Nitropropane **	33
_____	N-Nitrosodiethylamine	197
_____	N-Nitrosodimethylamine	198
_____	N-Nitroso-di-n-butylamine	199
_____	N-Nitrosomethylethylamine	200
_____	N-Nitrosomorpholine	201
_____	N-Nitrosopiperidine	202
_____	N-Nitrosopyrroldine	203
_____	Oxamyl *	284
_____	Parathion	204
_____	Total PCB's	205
_____	Pebulate *	285
_____	Pentachlorobenzene	206
_____	PeCDDs (All Pentachloro-dibenzo-p-dioxins)	207
_____	PeCDFs (All Pentachloro-dibenzofurans)	208
_____	Pentachloroethane *	209
_____	Pentachloronitrobenzene	210
_____	Pentachlorophenol	211
_____	Phenacetin	212
_____	Phenanthrene	213
_____	Phenol	214
_____	Phorate	215
_____	Phthalic acid *	216
_____	Phthalic anhydride	217
_____	Physostigmine *	286

Line #'s	Constituent	Legend #
_____	Physostigmine salicylate **	287
_____	Promecarb *	288
_____	Pronamide *	218
_____	Propham *	289
_____	Propoxur *	290
_____	Prosulfocarb *	291
_____	Pyrene	219
_____	Pyridine	220
_____	Safrole	221
_____	Silvex (2,4,5-TP)	222
_____	TCDDs (All Tetrachloro-dibenzo-p-dioxins)	225
_____	TCDFs (All Tetrachloro-dibenzofurans)	226
_____	1,2,4,5-Tetrachlorobenzene	224
_____	1,1,1,2-Tetrachloroethane	227
_____	1,1,2,2-Tetrachloroethane	228
_____	Tetrachloroethylene	229
_____	2,3,4,6-Tetrachlorophenol	230
_____	Thiodicarb *	292
_____	Thiophanate-methyl *	293
_____	Toluene	231
_____	Toxaphene	232
_____	Triallate *	294
_____	Tribromomethane (Bromoform)	233
_____	2,4,6-Tribromophenol	295
_____	1,2,4-Trichlorobenzene	234
_____	1,1,1-Trichloroethane	235
_____	1,1,2-Trichloroethane	236
_____	Trichloroethylene	237
_____	Trichloromonofluormethane	238
_____	2,4,5-Trichlorophenol	239
_____	2,4,6-Trichlorophenol	240
_____	2,4,5-T (2,4,5-Trichloro-phenoxacetic acid)	223
_____	1,2,3-Trichloropropane	241
_____	1,1,2-Trichloro-1,2,2,-trifluoroethane	242
_____	Triethylamine *	296
_____	tris-(2,3-Dibromopropyl)	243
_____	Vermolate *	297
_____	Vinyl chloride	244
_____	Xylenes- mixed isomers	245

** Constituent not regulated under F039* ***F005 wastes containing no other F001-F005 solvents*

DWALKER.LDR 2.02.01.99

Note: Line # 's are from the Notification Form, not the hazardous waste manifest.

LDR 7/7

ATTACHMENT 4

WASTE SHIPMENT SUMMARY – Page 1

TEXAS NATURAL RESOURCE
CONSERVATION COMMISSION
Registration & Reporting (MC-129)
P.O. Box 13087
Austin, Texas 78711-3087
(512)239-6413

TNRCC

REPORT STATUS

- ☐ Original Summary
- ☐ Revised Summary
- ☐ Supplemental to Summary

TNRCC WASTE SHIPMENT SUMMARY

(1-5) Generator's TNRCC Solid Waste Registration (SWR) Number

S 1 (6 - 7)

REPORT FOR: Month Year

Generator's EPA ID

(8) Generator's Name: (32)

Site Address: Street City State Zip

Mailing Address: Street/P.O. Box City State Zip

This form is used by
O unregistered Texas generators when shipping Hazardous and/or Class 1 waste and/ or
O *out-of-state domestic generators* shipping Hazardous waste through Texas to a foreign country.

This form is due on the 25th of the month following the month of the reporting period. For example, the report for shipments made in May is due on the 25th of June.

BOXES Indicate the Location of → Information on the Manifest

Non-industrial Waste Shipments:
Report only Hazardous waste shipped.

NOTICE
If you generate 220 lbs. or less of hazardous waste per month and 2.2 lbs. or less of acutely hazardous waste per month, and generate less than 220 lbs. of Industrial Class 1 Waste per month you do not have to complete this report.

STATE MANIFEST DOCUMENT NUMBER *BOX A*								STATE FACILITY'S ID (RECEIVER) *BOX G*					US EPA ID (RECEIVER) If no EPA ID print the Designated Facility Name *BOX10*												WASTE NO. (TEXAS WASTE CODE) *BOX I*							
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65

EPA HAZARDOUS WASTE NUMBER(S) Required for Hazardous Waste Only, Non-Hazardous leave blank Four character code starting with D, F, K, P, or, U (i.e., D001)																QUANTITY Decimals must be in their own boxes *BOX 13*										U O M	HANDLING (SYSTEM TYPE) CODE *BOX K*			DATE SHIPPED MMDDYYYY *BOX 16*							
66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91		92	93	94	95	96	97	98	99	100	101	102
																										M											
																										M											
																										M											

Quantity Unit of Measure (UOM) (All wastes must be reported in POUNDS (P), KILOGRAMS (K), OR TONS (T)) ↗

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete.

Prepared by: ______________________
Print Name

____
Signature

____
Telephone Date

Authorized by: ______________________
Print Name

____
Signature

____
Telephone Date

002241

ADDITIONAL INFORMATION FOR COMPLETING THE WASTE SHIPMENT SUMMARY

If the receiver is a Texas facility, then use the ID from Box G on the manifest. If the receiver is in another state, use the proper code from this table.

State Facility's ID (Receiver) for Out-of-State Facilities

Alabama	Z0001	Hawaii	Z0015	Michigan	Z0026	North Carolina	Z0037	Vermont	Z0050
Alaska	Z0002	Idaho	Z0016	Minnesota	Z0027	North Dakota	Z0038	Virginia	Z0051
Arizona	Z0004	Illinois	Z0017	Mississippi	Z0028	Ohio	Z0039	Washington	Z0053
Arkansas	Z0005	Indiana	Z0018	Missouri	Z0029	Oklahoma	Z0040	West Virginia	Z0054
California	Z0006	Iowa	Z0019	Montana	Z0030	Oregon	Z0041	Wisconsin	Z0055
Colorado	Z0008	Kansas	Z0020	Nebraska	Z0031	Pennsylvania	Z0042	Wyoming	Z0056
Connecticut	Z0009	Kentucky	Z0021	Nevada	Z0032	Rhode Island	Z0044	Navajo Nation	Z0057
Delaware	Z0010	Louisiana	Z0022	New Hampshire	Z0033	South Carolina	Z0045		
Dist. of Columbia	Z0011	Maine	Z0023	New Jersey	Z0034	South Dakota	Z0046		
Florida	Z0012	Maryland	Z0024	New Mexico	Z0035	Tennessee	Z0047		
Georgia	Z0013	Massachusetts	Z0025	New York	Z0036	Utah	Z0049		

Texas Waste Code: Begin entering the waste code in column 58.

EPA Hazardous Waste Numbers: These numbers ONLY apply to Hazardous Waste and can be found in 40 Code of Federal Regulations Part 261. If more than four waste codes apply, use the four that best describe the waste. DO NOT use an additional line for EPA codes.

HANDLING (System Type) Codes: The receiver should supply you with the correct Handling Code in Box K on the manifest. Below is the list of Handling Codes and a brief description of each code. For reporting purposes, the system type code selected should be for the final disposition of the waste, even if the waste is stored prior to disposal.

HANDLING (SYSTEM TYPE) CODES

METALS RECOVERY (FOR REUSE)
- M011 High temperature metals recovery
- M012 Retorting
- M013 Secondary smelting
- M014 Other metals recovery for reuse: e.g., ion exchange, reverse osmosis, acid leaching, etc.

SOLVENTS RECOVERY
- M021 Fractionation/distillation
- M022 Thin film evaporation
- M023 Solvent extraction
- M024 Other solvent recovery

OTHER RECOVERY
- M031 Acid regeneration
- M032 Other recovery: e.g., waste oil recovery, non-solvent organic recovery, etc.

INCINERATION
- M041 Incineration - liquids
- M042 Incineration - sludge
- M043 Incineration - solids
- M044 Incineration - gases

ENERGY RECOVERY (REUSE AS FUEL)
- M051 Energy recovery - liquids
- M052 Energy recovery - sludge
- M053 Energy recovery - solids

FUEL BLENDING
- M061 Fuel blending

AQUEOUS INORGANIC TREATMENT
- M071 Chrome reduction followed by chemical precipitation
- M072 Cyanide destruction followed by chemical precipitation
- M073 Cyanide destruction only
- M074 Chemical oxidation followed by chemical precipitation
- M075 Chemical oxidation only
- M076 Wet air oxidation
- M077 Chemical precipitation
- M078 Other aqueous inorganic treatment: e.g., ion exchange, reverse osmosis,

AQUEOUS ORGANIC TREATMENT
- M081 Biological treatment
- M082 Carbon adsorption
- M083 Air/steam Oxidation
- M084 Wet air oxidation
- M085 Other aqueous organic treatment

AQUEOUS ORGANIC AND INORGANIC TREATMENT
- M091 Chemical precipitation and biological treatment
- M092 Chemical precipitation and carbon
- M093 Wet Air Oxidation
- M094 Aqueous Organic

SLUDGE TREATMENT
- M101 Sludge de-watering
- M102 Addition of excess lime
- M103 Absorption/adsorption
- M104 Solvent extraction

STABILIZATION
- M111 Chemical fixation using cementitious/ pozzolanic
- M112 Other stabilization materials

OTHER TREATMENT
- M121 Neutralization only
- M122 Evaporation only
- M123 Settling/clarification only
- M124 Phase separation (e.g., emulsion breaking, filtration)
- M125 Other treatment

DISPOSAL
- M131 Land treatment/applications farming
- M132 Landfill
- M133 Surface impoundment (to be closed as a Landfill)
- M134 Deepwell/underground injection
- M135 Direct discharge to sewer/POTW (no prior treatment)
- M136 Direct discharge to surface water under NPDES (no prior treatment)
- M137 Other disposal

STORAGE
- M141 Storage

APPENDIX H

COMMUNITY RELATIONS PLAN

POST-CLOSURE COMMUNITY RELATIONS PLAN

UPDATED FOR THE

BRIO REFINING SUPERFUND SITE

HARRIS COUNTY, TEXAS

February 2004

BRIO SITE TASK FORCE
MAINTENANCE, OPERATIONS, AND MONITORING PLAN

INTRODUCTION

The goal of this Community Relations Plan (CRP) is to provide residents near the Brio Refining Superfund site and other interested parties timely and accurate information after the Remedial Design/Remedial Action (RD/RA) phase of the project is complete.

This plan outlines the general communications efforts appropriate to the Brio Site, and may be modified as circumstances warrant.

The Brio Site Task Force first developed a Community Relations Plan in 1985. It was subsequently updated in 1989, 1991, 1999, and now again in 2004. The objectives of the plan have been to identify local concerns, provide timely and accurate information, and to maintain communication with community leaders. It has been essential to the BSTF, community members, EPA, and other relevant agencies to maintain an ongoing and meaningful community outreach program.

OBJECTIVES OF THE PLAN

1. Maintain open and ongoing communications with all site stakeholders, to provide information about ongoing work at the Brio site, including remedial activities, and to provide mechanisms for those audiences to relate their concerns to the Brio Site Task Force.

2. To share identified concerns with the U. S. Environmental Protection Agency (EPA), monitor shifts or changes in these concerns, and to address them directly through planned activities or written communications.

3. Provide updates through community meetings, the local repository, and Task Force newsletters so the community and other interested parties will have access to timely and accurate information.

4. Maintain the established a telephone hotline.

5. Advise both the Task Force and EPA of any community concerns about planned activities.

6. Assist EPA, as needed, in interfacing with the Community Advisory Group (CAG) or with other community relations activities, as requested.

SITE HISTORY

This 59-acre site was built in the mid-1950s as a chemical reprocessing facility for materials that were to be re-used in other industries. The facility, through its various owners and operators, was used for reprocessing and manufacturing, not disposal. Some of the materials to be reprocessed at the site were stored in earthen pits. Based on emerging environmental standards, the State of Texas ordered the closure of the pits in the late 1970s. While the then current owners (JOC Oil Aromatics) made some effort to complete the closure of the pits, by the time the site was abandoned by Brio Refining in 1982, certain materials remained in the soils and groundwater at the site that required further environmental remediation. That further effort was managed by the Environmental Protection Agency (EPA) under the Superfund law, beginning with the EPA's proposal to include the site on the National Priorities List (NPL) in 1984.

Under Superfund law, if the site's owner/operator is insolvent, those companies that did business with them must assume liability for the cost of cleanup. This provision can extend to companies that delivered product, like transportation companies, or suppliers of product, and even banks that provide financing. The companies known as the Brio Site Task Force, which paid for and implemented the remedy – under the EPAs oversight – were such companies.

After extensive testing and analysis, the EPA in 1988 called for incineration of all on-site materials exceeding acceptable levels. During 1989 most of the old process equipment used by the refining operations was dismantled and cleared from the site.

However, area residents were concerned about the presence of an incinerator in the community and worked diligently with the Superfund Revitalization Office (SRO) out of the Washington, D.C. EPA office to have the remedy changed. In April of 1994, just prior to start up of the incinerator, the SRO issued a report, calling for additional studies at Brio. Pending resolution of the issues raised by SRO's recommendations, all work on the incineration remedy was suspended.

In August 1994, the EPA formed a Community Advisory Group to formally involve citizens in remediation plans at Brio. The BSTF and EPA met jointly with the Community Advisory Group over many months to discuss potential alternatives and to arrive at consensus on a remedy. Ultimately, all parties agreed upon a containment remedy that would feature an underground barrier wall surrounding the site, a multi-layered cover of the site, and an ongoing groundwater and DNAPL recovery and treatment system. DNAPL, short for dense non-aqueous phase liquids, is a dark oily like substance that is denser than water, so it tends to sink.

Dismantling of the incinerator and support facilities were completed in November 1994. The BSTF began work on the newly agreed upon remedy in March 1999, after the new remedy was approved by the proper legal entities.

The barrier wall, which was designed to minimize the migration of materials, extends 7,500 feet around the perimeter of the site and is approximately 45 feet deep. The majority of the barrier wall is a slurry wall – a mixture of native and bentonite clays, however, sheet pile was installed along Mud Gully for greater stability. The cover system, which consists of a gas collection layer, a flexible membrane liner, 18-inches of compacted clay and a vegetative cover, was designed to eliminate contact with pit residuals, minimize water infiltration, and capture potential emissions from the site, if present. The BSTF also constructed a water treatment facility that was designed and built to treat the groundwater pumped from within the barrier wall. This water is treated to meet strict Federal standards and is tested before being discharged to Mud Gully.

The Brio Site Task Force will continue ongoing operation and maintenance of the site indefinitely.

PRIOR COMMUNICATIONS

Community relations activities were undertaken under separate, formal plans by both the U.S. EPA Region 6 and the Brio Site Task Force. Communications began before the Brio site was formally placed on the National Priorities List, and have continued to the present time. These efforts have been supplemented through participation of a number of state and federal agencies. These include the Texas Department of Water Resources, Texas Air Control Board, Texas Water Commission, Texas Commission on Environmental Quality, Texas Department of Health, Centers for Disease Control, Agency for Toxic Substances and Disease Registry, Harris County Pollution Control, and Harris County Health Department.

The basic goals of communications have been, and remain, to fulfill the objectives of sound community relations practice, which include:

--Identify local concerns;
--Provide timely and accurate information;
--Maintain open lines of communications with all interested parties; and
--Involve local citizens in the Superfund process.

Prior communications include regular fact sheets and newsletters, public meetings, small group meetings and workshops, site tours, open houses, telephone contact and briefings for appointed and elected officials. Under agreement with the EPA, the Task Force also paid the rent, utilities, and supplies for the local EPA information office from 1991 to 2001, when the EPA closed the office due to decreasing community concern over the site.

EPA and the Brio Site Task Force are separate entities. The community will receive communications at various times from each of the entities, separately.

COMMUNITY PROFILE

The Brio Refining, Inc. Superfund site is located in unincorporated Harris County, except for a small portion of the site, which falls under the jurisdiction of the City of Friendswood. There is no local governmental structure, no mayor or city council for the unincorporated portions.

The closest subdivision – which is currently under construction by KB Homes – will be located northwest of the site. Dixie Woods, Dixie Hollow and Woodcreek, lie west of the site just off Dixie Farm Road, approximately one-half mile from the eastern Brio site property lines, and to the northwest, there are several large subdivisions with several thousand residents. The geographic area surrounding the site is informally known as the Southbelt area and is served by the Clear Creek Independent School District and the Pasadena Independent School District. Between the early 1980s and 1997, the Southbend Subdivision shared a common boundary at the northern property line of Brio North. The houses in this subdivision were purchased and subsequently dismantled during 1997 by others.

Friendswood, with a population of 30,500 lies to the west, and the City of Pearland with 41,000 residents is to the northwest. The principal business and economic centers of the area include Ellington Field, NASA and related aerospace interests, and the University of Houston Clear Lake campus. Nearby Memorial Hermann Hospital Southeast serves a wide geographic area, as does San Jacinto College South Campus.

COMMUNICATION METHODS

Formal communication methods include briefings of community leaders and elected/appointed officials at local, state and federal levels, newsletters, formal and informal meetings with area residents, news releases to the mass media, and updating the information repository established by the U. S. EPA.

Informal inquiries to the Brio Site Task Force from homeowners or other interested parties will be handled on a telephone information line maintained by Toby Stark Public Relations, LLC, the Task Force's public information representative. The information telephone number is: 281/873-0222.

Inquiries to the EPA Region 6 may be made by calling John Meyer, Brio site project manager at 214/665-6742 or 800/533-3508, Toll Free.

Communication from the Brio Site Task Force will continue to focus on current and planned site operations as well as ongoing maintenance activities, addressing specific topics of particular interest to the community.

1. Write and distribute a newsletter updating the community and other interested parties on the operations and maintenance phase of the project. This will be written at the end of 2004, if necessary.

2. Host two meetings and site tours for the Community Advisory Group in 2004, and one meeting/tour in 2005.

3. Host two meetings for the site's emergency responders in 2004, and one meeting in 2005.

4. Provide an informational sign on the site with key contact names and numbers.

5. Update the information repository at the San Jacinto College South library with site documents, newsclips, activity reports and related materials. This activity will take place through 2005, after which the repository will be dismantled and maintained by the EPA in Dallas.

6. A comprehensive fact sheet will be available at the information repository and from key site contacts.

In addition to communication from the Brio Site Task Force, the EPA will continue to maintain information on the Brio site on its Web site: www.epa.gov/region6/superfund. Click on "Texas" and then "Brio Refining, Inc."

STAKEHOLDER CONCERNS

New Residents
As the Southbelt area continues to grow and expand, people considering moving into the area want information assuring them that the site doesn't pose any health concerns.

TABLE 2
TREATED WATER DISCHARGE CRITERIA

PARAMETER	DISCHARGE LIMIT (mg/l)	PQL (mg/l)
General Chemistry		
pH	6.0-9.0 (units)	n/a
BOD	81	5
COD	568	20
Sulfur (Sulfide)	0.6	0.2
Phosphorus	4	0.1
Ammonia as N	23	4
Oil and Grease	31	10
Phenolics	0.7	0.2
TSS	62	5
Metals		
Copper	0.093	0.010
Volatiles		
1, 1, 2-Trichloroethane	0.054	0.010
1, 2-Dichloroethane	0.211	0.010
Vinyl Chloride	0.268	0.010
Methylene Chloride	0.089	0.010
Semivolatiles		
Bis(2-chloroethyl)ether	0.757	0.020
Total Carcinogenic PNAs[1]	0.350 (total)	0.020 (each)
Total Noncarcinogenic PNAs[2]	0.470 (total)	0.020 (each)

1. Benzo(a)anthracene
   Benzo(b)fluoranthene
   Benzo(k)fluoranthene
   Benzo(a)pyrene
   Dibenzo(a,h)anthracene
   Indeno(1,2,3,c,d)pyrene
   Chrysene

2. Acenaphthene
   Anthracene
   Pyrene
   Fluoranthene
   Fluorene
   Naphthalene
   Phenanthrene

VOCs

- 1,1,2-trichloroethane (0.054)
- 1,2-dichloroethane (0.211)
- Vinyl Chloride (0.268)
- Methylene Chloride (0.089)

Semi-volatiles

- Bis(2-chloroethyl)ether (0.757)
- Total Carcinogenic PNAs (0.350)
  - Benzo(a)anthracene
  - Benzo(b)fluoranthene
  - Benzo(k)fluoranthene
  - Benzo(a)pyrene
  - Dibenzo(a,h)anthracene
  - Indeno(1,2,3,c,d)pyrene
  - Chrysene
- Total Noncarcinogenic PNAs (0.470)
  - Acenapthene
  - Anthracene
  - Fluoranthene
  - Fluorene
  - Phenanthrene
  - Pyrene
  - Naphthalene

(discharge limit – mg/l)

4.4 LABORATORY PRELIMINARY AND FINAL REPORTS

Brio management should make prior arrangements with the laboratory to provide a preliminary report to be faxed to the Brio Site within three working days of sample receipt at the laboratory. The preliminary report will contain the following:

- Site name
- Field sample ID
- Laboratory sample ID
- COC copy showing receipt at laboratory

and

For each parameter in Table 1:

- Analytical result with units
- Practical quantitation limit with units
- Discharge limit with units

The laboratory will deliver a final report to the Brio Site approximately 30 days following analysis. The final report will provide data that will allow a third party to validate the report.